

City of Carlsbad



Engineering Standards

Volume 4 Storm Water Standards Manual

2004 Edition

Revised 3/24/08, 6/4/08, 1/22/10, 3/24/10 and 1/14/11

CITY OF CARLSBAD ENGINEERING STANDARDS

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REVISIONS/ADDENDUM		
CHAPTER/ PAGE/DWG.	ITEM	REVISION DATE
All of Volume 4	Update to implement new storm water requirements	3/24/2008
Revised Cover Sheet (all), Table of Contents (all), Introduction (all), Chapter 2 text (all) Chapter 2 Appendix C (all), Chapter 3 text (all) and Chapter 3 Appendix B. Added Chapter 2 Appendix G	Changed all Section references to Chapter references. Minor revisions throughout Chapters 2 and 3 to correct typographical errors, correct certain document references and improve clarity. Update Stormwater Standards Questionnaire on redevelopment projects. Revised list of exempted projects on page 10 of Chapter 3 and on Storm Water Compliance Exemption Form in Appendix B. Cover Sheet revised to read '2004 Version' with listed revision dates. Added Appendix G (Interim Hydromodification Criteria) to Chapter 2. Revised Chapter 2 Appendix C to specify Qualified SWMP Preparer.	6/04/2008
Update Chapter 2	Update priority project type to include 1-acre projects	1/22/10
Update Chapters 1 & 2	Replace entire chapters to implement new model SUSMP requirements as required by Order 2007-01	3/24/10
Update Chapters 1 & 2	Replace entire chapters to incorporate hydromodification requirements as required by Order 2007-01	1/14/11

Chapter 1

STORM WATER STANDARDS MANUAL INTRODUCTION

A Storm Water Management section of the Carlsbad Engineering Standards was initially adopted in response to the California Regional Water Quality Control Board San Diego Region Order No. R9-2001-01 CAS0108758 Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego County, the San Diego Unified Port District, and the San Diego County Regional Airport Authority (Municipal Permit). In 2008, this manual was updated to incorporate additional changes required by the California Regional Water Quality Control Board San Diego Region Order No. R9-2007-01 (2007 Municipal Permit).

In 2010, an update was made to the Storm Water Standards to incorporate supplemental changes as required by the 2007 Municipal Permit. These changes included expanding stormwater requirements for new development and redevelopment projects, clarifying descriptions on the effectiveness of stormwater treatment BMP's, and adding minimum standards for Low Impact Development (LID).

In 2011, changes were made to Chapter 2 to incorporate hydromodification requirements as required by the 2007 Municipal Permit.

The SUSMP now includes an integrated LID site design methodology that uses small-scale detention and retention to minimize pollutants conveyed by runoff and to mimic pre-project site hydrological conditions.

The City's Storm Water Standards: (1) accommodate the requirements of the updated Municipal Permit and Countywide model SUSMP; (2) consolidate construction BMP standards into one location; (3) clarify existing standards and incorporate the new standards; and, (4) incorporate the requirements of the General Construction Permit, the General Linear Utility Permit and the General Industrial Activity Permit. The new manual consolidates all storm water BMP standards for post construction, construction and business activity requirements into one comprehensive manual entitled the "City of Carlsbad Storm Water Standards Manual" hereinafter referred to as "Storm Water Standards Manual".

The new Storm Water Standards Manual is comprised of four primary chapters as follows;

1. Chapter 1 – Introduction
2. Chapter 2 – Standard Urban Stormwater Management Plan (SUSMP) includes threshold requirements to classify projects between standard storm water projects and priority development projects. Also includes standards and requirements for the selection of permanent post

construction BMPs including post construction inspection and inventory maintenance requirements. Hydromodification criteria has been added to this chapter.

3. Chapter 3 – Construction Storm Water Pollution Prevention Plan (SWPPP) Standards – includes standards and requirements for the preparation of a Construction SWPPP in accordance with the Municipal Permit, General Construction Permit and General Linear Utility Permit.
4. Chapter 4 – This Section is currently reserved for the Business Activity Storm Water Pollution Prevention Plan (SWPPP) Standards.

The Storm Water Standards Manual is intended to be used at all phases of the development process. The manual also has application to City Capital Improvement Program development process.

Chapter 2

Standard Urban Storm Water Management Plan (SUSMP)

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Introduction

This Standard Urban Stormwater Management Plan (SUSMP) was originally created in response to the municipal stormwater NPDES permit (Order No. 2001-01) issued by the California Regional Water Quality Control Board for the San Diego Region (Regional Water Board). In January 2007, the Regional Water Board reissued the municipal stormwater NPDES permit (Order No. 2007-01) to San Diego area municipal Copermittees (Municipal Permit). As required by the Municipal Permit, this SUSMP has been updated to incorporate the changes into the city's process for new and redevelopment projects.

The Municipal Permit required SUSMP's to include updates to expand stormwater requirements for new development and redevelopment projects. Stormwater treatment requirements have been made more widely applicable and more stringent; minimum standards for Low Impact Development (LID) have been added, and the Copermittees are required to develop and implement criteria for the control of runoff peaks and durations from development sites. In general terms, LID is a strategy using sustainable approaches that addresses urban runoff resulting from new and redevelopment projects by incorporating various water quality techniques depending on the design opportunities and constraints of a project.

As required by the Municipal Permit, the Copermittees prepared an updated Countywide Model Standard Urban Storm Water Management Plan (countywide model SUSMP) to replace the previous countywide model SUSMP, which has been in effect since 2002. The updated countywide model SUSMP is available for download in .PDF format at www.projectcleanwater.org. The city took the countywide model SUSMP, revised it to address the city's local needs, resulting in this new updated Carlsbad local SUSMP (SUSMP, hereafter).

For certain projects, there are minimum stormwater standards that apply. Applicants processing projects are subject to either **Standard Stormwater requirements** or **Priority Development Project requirements**. Both categories must incorporate minimum stormwater standards into their project that incorporate site design Best Management Practices (BMP's), also known as source control, that reduce urban runoff and/or target pollutants from specified on-site sources, such as refuse areas, outdoor storage areas, and vehicle washing and repair facilities. Refer to Section 1 for more information.

For other projects meeting criteria per the Municipal Permit, there are additional stormwater standards that apply. These additional stormwater standards apply to projects subject to **Priority Development Project requirements**. To demonstrate compliance with these additional standards, applicants must prepare and submit a report/document called a **Stormwater Management Plan** (SWMP). Applicants for these projects must demonstrate compliance with the three major stormwater criteria per the SUSMP. They are:

- 1) Satisfying Standard Stormwater requirements. These generally consist of incorporating LID, site design, and source control BMP's into a project. Refer to Section 1 for more information.
- 2) Selection and numeric sizing of treatment control BMP's so that development runoff will be infiltrated or else treated by these permanent facilities. Refer to Section 2 for details.
- 3) Incorporating flow-control (hydromodification) facilities to ensure that post-development project runoff peak flow rates and duration do not exceed pre-development figures (hydromodification). Certain projects may be considered exempt from hydromodification requirements. Refer to Section 2 for details.

The complex methods satisfying hydromodification criteria are detailed in the approved final Hydromodification Management Plan (HMP) prepared by Brown & Caldwell. The HMP can be viewed and downloaded from the project clean water website at: www.projectcleanwater.org. The HMP is hereby incorporated into this SUSMP by reference.

The integrated LID design procedure allows an applicant to select and size either treatment control BMP's (TCBMP's) and also a new comprehensive BMP's called Integrated Management Practices (IMP's) that will satisfy all three criteria above. To streamline the design procedure for IMP's, the web-based **San Diego County BMP Sizing Calculator** was developed to size IMP's.

Although the integrated LID design procedure is encouraged, an applicant may elect not to use the procedure. However, they will still need to demonstrate in the SWMP, separately, how the projects complies with the applicable 1) LID (site design) criteria, 2) Stormwater treatment control criteria, and 3) Hydromodification management criteria per this SUSMP.

For projects subject to hydromodification, and the applicant chooses not to use San Diego County BMP Sizing Calculator to select and size IMP's, the applicant may use the automated pond sizer to simulate pre-project and post-project runoff, including the effect of extended detention facilities to mitigate peak flows and durations for the project, which is included in the BMP Sizing Calculator, or by producing a continuous simulation hydrologic computer model, subject to city approval. Refer to the HMP for criteria on computer modeling continuous rainfall run-off curves. Although the pond sizer or continuous simulation model will assist in sizing flow-control (hydromodification) facilities to demonstrate compliance with HMP, the applicant must still demonstrate how the projects satisfies the other two stormwater criteria above (LID and treatment control).

Along with detailed design procedures, this SUSMP includes design information and criteria for dispersal of runoff to landscaped areas and for pervious pavements and to IMP's such as bioretention facilities, flow-through planters, dry wells, infiltration basins, and cisterns. Where feasible and where allowed, water in cisterns may be directed to non-potable uses, augmenting water supplies. With clayey soils, storm water can still be treated through bioretention facilities and planter boxes if designed with an impermeable barrier so that runoff does not saturate native soils; instead, runoff is filtered through an engineered soil mix before being captured in an

underdrain and conveyed via underground storm drains. This configuration may be needed where groundwater is high, is contaminated, or where increasing soil moisture may present a hazard to foundations or slope stability.

After a project is built, as required by the Municipal Permit, this SUSMP includes a program to demonstrate that approved stormwater treatment BMP's/facilities per the SWMP are operating effectively. To facilitate implementation of these programs, this SUSMP includes instructions to prepare a single-sheet post-construction BMP exhibit with their SWMP's and requirements for applicants to prepare detailed maintenance plans.

This updated SUSMP provides the applicant with step-by-step instructions for preparing a SWMP for review by the city. The recommended steps are:

1. Assemble needed information.
2. Identify site opportunities and constraints.
3. Specify source controls using the sources/source control checklist in the appendix.
4. Develop and document the project's drainage design and follow the integrated LID design procedure to select/size IMP's (or treatment control BMP's and flow-control facilities) to satisfy applicable stormwater criteria.
5. Describe ongoing maintenance of treatment and flow-control facilities and how long-term maintenance will be ensured.
6. Complete and submit the SWMP concurrent with your application.

Refer to the SWMP requirements checklist, latest version, on the city website at www.carlsbadca.gov/development-forms.

► HOW TO USE THE SUSMP

This Standard Urban Stormwater Mitigation Plan (SUSMP) will help you ensure your project complies with the current California Regional Water Quality Control Boards' requirements. Most applicants will require the assistance of a qualified civil engineer, architect, and/or landscape architect. If there are terms you find puzzling, try finding answers in the glossary (see table of contents).

To use the SUSMP, start by reviewing [Section 1](#) to find out the type of stormwater quality requirements that apply to your project. Your project will be either subject to Standard Stormwater requirements or Priority Development Project Requirements. The requirements for both requirements are discussed in this section. Although discussed in greater detail in other sections, Section 1 also provides an overview of the process of planning, design, construction, operation, and maintenance addressing comprehensive stormwater compliance for your project.

If your project is subject to Priority Development Project requirements, then proceed to [Section 2](#). Section 2 provides background on key stormwater concepts and water quality

regulations, including stormwater layout and design criteria. Section 2 also discusses the types of pollutants associated with different uses and also shows you how to select treatment control BMP's for your project.

Section 3 includes information on assembling a Storm Water Management Plan (SWMP) for your project. Refer the SWMP checklists (city form No. E-35) on the city website at www.carlsbadca.gov/development-forms.

Section 4, the Low Impact Development Design Guide, includes design procedures, calculation procedures, and instructions for presenting your design and calculations in your SWMP.

In **Section 5** you'll find a detailed description of the process for ensuring operation and maintenance of your stormwater facilities over the life of the project. The Section includes step-by-step instructions for including a Stormwater Facilities Operation and Maintenance Plan in the SWMP.

Throughout each Section, you'll find references and resources to help you understand the regulations, complete your SWMP, and design stormwater control measures for your project.

Construction-Phase Controls

Your SWMP is for SUSMP compliance and is a separate document from the Storm Water Pollution Prevention Plan (SWPPP). A SWPPP provides for interim measures to control sediment and other pollutants during construction at sites that disturb one acre or more. See the Construction Handbook at www.cabmphandbooks.org for more information on SWPPPs.

If you are reading the Acrobat version on a computer with an internet connection, you can use hyperlinks to navigate the document and to access various references. The hyperlinks are throughout the text, as well as in "References and Resources" sections and in the **Bibliography**. Some of these links (URLs) may be outdated. In that case, try entering portions of the title or other keywords into a web search engine.

► PLAN AHEAD TO AVOID THE MOST COMMON MISTAKES

The most common (and costly) errors made by applicants for development approvals with respect to stormwater quality compliance are:

1. Not understanding the level of storm water requirements for your project. This starts by correctly filling out a Storm Water Standards Questionnaire (Section 1) and following the appropriate requirements whether your project is subject to "Standard Stormwater Requirements" or "Priority Development Project Requirements".
2. Assuming proprietary stormwater treatment facilities will be adequate for compliance. Most aren't (Section 2).
3. Not planning for compliance early enough. You should think about your strategy for stormwater quality compliance before completing a conceptual site design or sketching a layout of subdivision lots (Section 3).

4. Not planning for periodic inspections and maintenance of treatment and flow-control facilities. Consider who will own and who will maintain the facilities in perpetuity and how they will obtain access, and identify which arrangements are acceptable to the city (Section 5).

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Determine your Stormwater Requirements

Determine how your development project must comply with stormwater quality requirements, and review the steps to compliance.

Storm Water Standards Questionnaire (SWSQ)

To find out the type of storm water requirements your project must meet, you'll first need to complete a **Storm Water Standards Questionnaire** (SWSQ), known as city form No. E-34. Please see the city's website at www.carlsbadca.gov/development-forms. When submitting any land use or plan check applications with the city, you will be required to complete and sign the SWSQ. Follow the instructions in the SWSQ to see if your project matches any of the categories. Please note that for submittals that do not include a SWSQ, they may be considered incomplete until they are provided to the city.

As part of your application review, the city will review each SWSQ to assess the selection and outcome to confirm whether your project is subject to Standard Stormwater Requirements or Priority Development Project Requirements.

If a SWSQ is incomplete or not correctly completed the city will return it as part of their review. If this happens, please make the necessary corrections and return the revised SWSQ to continue the processing of your project submittal.

Applying SUSMP Requirements

► MINIMUM LOW IMPACT DEVELOPMENT PRACTICES

The Municipal Permit requires Low Impact Development (LID) practices be used on all projects to minimize directly connected impervious area and promote infiltration. For all projects, the minimum standards are:

SECTION 1: DETERMINE YOUR STORMWATER REQUIREMENTS

- Drain a portion of impervious areas into pervious areas, if any.
- Design and construct pervious areas, if any, to effectively receive and infiltrate runoff from impervious areas, taking into account soil conditions, slope, and other pertinent factors.
- Construct a portion of paved areas with low traffic and appropriate soil conditions with permeable surfaces.

These minimum LID practices have been incorporated into Standard Stormwater requirements below. Since all projects must meet, at a minimum, Standard Stormwater requirements, all projects will be required to satisfy minimum LID practices.

► PHASED PROJECTS

When determining how SUSMP requirements apply, a “project” should be defined consistent with California Environmental Quality Act (CEQA) definitions of “project.” That is, the “project” is the whole of an action which has the potential for adding or replacing or resulting in the addition or replacement of roofs, pavement, or other impervious surfaces and thereby resulting in increased flows and stormwater pollutants. “Whole of an action” means the project may not be segmented or piecemealed into small parts if the effect is to reduce the quantity of impervious area for any part to below the SUSMP thresholds.

city staff may require, as part of an application for approval of a phased development project, a conceptual or master SWMP which describes and illustrates, in broad outline, how the drainage for the project will comply with the SUSMP requirements. The level of detail in the conceptual or master SWMP should be consistent with the scope and level of detail of the development approval being considered. The conceptual or master SWMP should specify that a more detailed SWMP for each later phase or portion of the project will be submitted with subsequent applications for discretionary approvals.

► NEW SUBDIVISIONS

If a tentative map or tentative parcel map approval would potentially entitle future owners to construct new or replaced impervious area which, in aggregate, could exceed one of the SUSMP thresholds in Appendix 1, then the applicant must take steps to ensure SUSMP requirements can and will be implemented as the subdivision is built out.

If the tentative map or tentative parcel map application does not include plans for site improvements, the applicant should nevertheless identify the type, size, location, and final ownership of stormwater treatment and flow-control facilities adequate to serve common private/public roadways and any other common areas, and to also manage runoff from an expected reasonable estimate of the square footage of future roofs, driveways, and other impervious surfaces on each individual lot. The city may condition approval of the map on implementation of stormwater treatment and other SUSMP measures when construction occurs on the individual lots. This may require noticing future property owners of requirements to construct, inspect and maintain onsite SUSMP treatment devices. At the city’s discretion, this

SECTION 1: DETERMINE YOUR STORMWATER REQUIREMENTS

condition may be enforced by Permanent Stormwater Quality BMP Maintenance Agreement(s) recorded against the properties.

If the city deems it necessary, the future impervious area of one or more lots may be limited by the Permanent Stormwater Quality BMP Maintenance Agreement or other recorded instrument. This might be necessary when a project is exempted from a SUSMP provision because the total impervious area is below a threshold, or to ensure runoff from impervious areas added after the project is approved does not overload a stormwater treatment and flow-control facility.

Private community stormwater treatment facilities should be located on one or more separate, jointly-owned parcels. Unless otherwise approved by the city, private community stormwater treatment facilities that manage runoff from other lots, streets, or from common areas should not be located on individual single-family residential lots. Maintenance requirements, access, and easements should all be considered and incorporated into the project design when developing stormwater treatment facilities.

Unless otherwise approved by the city, storm runoff from public streets should be treated by separate public storm water facilities.

After consulting with city staff, applicants for subdivision approvals will propose one of the following four options, depending on project characteristics and local policies:

1. Show the number of parcels and the total impervious area to be created on all parcels could not, in the future, exceed any of the thresholds in the SWSQ.
2. Show that, for each and every lot, the intended use can be achieved with a design which disperses runoff from roofs, driveways, streets, and other impervious areas to self-retaining pervious areas, using the criteria in Section 4.
3. Prepare improvement and/or grading plans showing drainage to treatment and/or flow-control facilities designed in accordance with this SUSMP, and execute a Permanent Stormwater Quality BMP Maintenance Agreement to ensure the proposed facilities will be constructed and maintained by subsequent owners.

For the option selected, city staff will determine the appropriate conditions of approval, Permanent Stormwater Quality BMP Maintenance Agreement, CC&R language, easements, or other legal instruments necessary to assure future compliance.

► GRANDFATHERING

The city is responsible to evaluate whether a projects has lawful prior approval (grandfathering) or not. Projects with lawful prior approval are those that have entered into a development agreement with the city or have an approved vested tentative map before January 14, 2011. They also are projects that have obtained a construction permit (e.g.: building or grading) and have started construction on the project before January 14, 2011. If a project has been deemed by the city to have lawful prior approval (grandfathered) the applicant may not have to meet the

new provisions of this updated SUSMP (hydromodification requirements). Verify with city staff before proceeding with any assumptions on grandfathering.

Standard Stormwater Requirements

If, after completing the SWSQ, your project does not meet any of the categories of a Priority Development Project, then your project will be required to comply with **Standard Stormwater Requirements**. In this scenario, the additional stormwater requirements for Priority Development Projects will not apply, but you will be required to demonstrate that your project meets all applicable storm water guidelines in this sub-Section and be required to implement the applicable source control BMP's as listed in Appendix 1.

Applicants with projects subject to Standard Stormwater Requirements shall evaluate the project site conditions and shall incorporate methods to minimize the introduction of pollutants generated by urban runoff from the project.

Standard Stormwater Requirements involve incorporating the following applicable techniques into your project design:

► MINIMIZE IMPERVIOUS SURFACES

Applicants shall apply a design approach that uses a balance of pervious and impervious surfaces in their project. With new and redevelopment projects applicants shall limit the use of impervious surfaces. Using excessive impervious surfaces tend to increase the potential of pollutant contact with urban runoff and increase runoff. The applicant should also explore the use of installing pervious pavement or pavers on walkways to reduce the imperviousness of the project.

► DISCONNECT DISCHARGES

Applicants shall incorporate measures to filter urban runoff from impervious areas by disconnecting discharges. Applicants should evaluate their design and make the necessary changes so they do not directly connect runoff from impervious surfaces to storm drains, conveyance systems and/or water courses.

Prior to discharge, runoff from impervious surfaces should, to the maximum extent practicable, discharge over landscaped/planter areas or pervious surfaces to promote infiltration and/or vegetative contact. Roof drains, driveways, walkways, parking areas, and patios should be designed to drain over turf or landscape areas prior to being collected by storm drain inlets. Using vegetated areas in your landscape design to intercept and filter runoff is an encouraged approach.

To address potential pollutants from being discharged directly to storm drains, storm drain inlets should not be installed within impervious surfaces. If inlets are necessary to collect runoff from impervious surfaces, then the drain system should be discharged over pervious/landscape areas prior to discharge from the site.

SECTION 1: DETERMINE YOUR STORMWATER REQUIREMENTS

When designing new storm water sump-pumps that serve areas that cannot drain by gravity means, design the discharge of the sump-pump so that it drains over landscape/turf area prior to discharge from the site. The pump discharge should also be managed to avoid erosive velocities.

► CONSERVE NATURAL AREAS

Applicants shall conserve natural areas, soils and vegetation and provide buffer areas between natural water bodies/water courses and the project footprint. This can be accomplished by clustering development on the least environmentally sensitive portions of the site while leaving the remaining land in a natural undisturbed condition. Applicant shall use the buffer area to discharge runoff to filter pollutants prior to discharge from the site. Applicants shall also consider leaving natural vegetated drainage courses versus replacing them with lined or impervious channels or underground storm drain systems, unless deemed necessary to repair or enhance unstable channels.

► STENCILING INLETS AND SIGNAGE

Applicants shall provide stamping or equivalent, for all applicable inlets collecting runoff from impervious areas. The stenciling shall include prohibitive language such as “No Dumping – I live downstream”.

The applicant may also install signs and/or graphic icons which prohibit dumping at public access points along channels and creeks within the project area, trailheads, parks, and building entrances/exits.

► LANDSCAPE DESIGN

Applicants shall include landscape areas in the design layout of the project. The applicant shall design the layout and select native, drought-tolerant species that do not require excessive irrigation in accordance with the city Landscape Manual, latest version. The applicant shall maximize canopy interception and employ water conservation by preserving native trees and shrubs. On those areas disturbed, the applicant shall plant additional native or drought tolerant trees and large shrubs in place of non-drought tolerant exotics.

► WATER EFFICIENT IRRIGATION

Applicants shall design new irrigation systems to reduce over-irrigation, employ rain shutoff devices preventing irrigation after rainfall events and minimize unnecessary runoff per Chapter 18.50 of the Municipal Code and the city Landscape Manual.

► PROTECT SLOPES AND CHANNELS

Applicant shall minimize disturbances to natural drainage courses or downstream properties by conveying runoff safely from the tops of slopes and ensuring slopes are properly vegetated or protected to avoid slope erosion. The applicant shall install energy dissipaters, such as rip-rap or splash pads at the outlets of storm drains, culverts, conduits or channels. Outlets should be designed to slow velocity down to non-erosive velocities.

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► TRASH RECEPTACLES

Trash storage areas shall be constructed per the city Standard dwg G-16, unless otherwise approved by the city. Trash storage areas shall be located on an impervious surface (pavement) designed not to allow run-on from adjoining areas. The trash storage shall be screened or walled to prevent the transport of trash. All trash containers shall include lids or covers to prevent contact with rainfall, or the storage areas may include a roof cover to avoid contact with rainfall.

► MATERIAL STORAGE AREAS

The applicant shall identify areas for storing urban materials having the potential to contaminate storm runoff. These materials shall be placed in an enclosure such as, but not limited to, a cabinet, shed or similar structure that prevents contact with rain and runoff. Depending on the project, the applicant may incorporate a secondary containment system such as dikes, berms or curbs.

Priority Development Project Requirements

Your project may be subject to Priority Development Project requirements, depending on the type, size, location, or characteristics of your project. New development or redevelopment projects may be subject to Priority Development Project requirements. If, depending on the outcome of completing your SWSQ, your project is subject to Priority Development Projects (PDP) requirements, in addition to satisfying Standard Stormwater Requirements, it must meet additional stormwater criteria per this SUSMP. Although the SWSQ is the form to use to determine stormwater standards for your project, below is some general information on what triggers a project to be subject to Priority Development Project requirements:

► NEW DEVELOPMENT

Projects on previously undeveloped land may be subject to PDP requirements if they are in one or more of the categories listed in the SWSQ.

To use the SWSQ, review each definition. If any of the definitions match your project, it is subject to **Priority Development Project** requirements. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development.

If, based on the outcome of the SWSQ, the project is subject to PDP requirements, the applicant will be required to prepare a **Storm Water Management Plan (SWMP)** to document how the project satisfies the additional storm water requirements per this SUSMP. Please proceed to Section 2.

If a new Development Project feature such as a parking lot falls into a Priority Development Project category, then the entire project footprint is subject to PDP requirements.

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► PREVIOUSLY DEVELOPED SITES

Projects on previously developed sites (“**redevelopment** projects”) may be subject to PDP requirements if they meet certain thresholds of project descriptions in the SWSQ.

If a SWSQ is incorrectly filled out based on potential impacts to stormwater quality, the city may determine a project is subject to PDP requirements. If this determination is made, the applicant will be notified through the review process and will be required to amend the SWSQ and return it to the city.

If, based on the outcome of the SWSQ, the project is subject to PDP requirements, the applicant will be required to prepare a **Storm Water Management Plan (SWMP)** to document how the project satisfies the additional storm water requirements per this SUSMP. Please proceed to Section 2.

► THE “50% RULE” FOR PREVIOUSLY DEVELOPED PROJECTS

For certain redevelopment projects, PDP requirements may apply to just the **project area** or possibly the **entire project site**. For redevelopment project creating or replacing more than 5,000 square feet of impervious area:

- If a new project results in an increase of, or replacement of, 50% or more of the previously existing impervious surface, and the existing development is a Priority Development Project type, then the entire project site will be subject to satisfying treatment control requirement per the Municipal Permit. Provide the necessary impervious surface area calculations as required to the city.
- If less than 50% of the previously impervious surface is to be affected, only that portion of the redevelopment envelope will be subject to treatment control requirements.

Projects limited to interior remodels, routine maintenance or repair, roof or exterior surface replacement, resurfacing and reconfiguring surface parking lots and existing roadways, new sidewalk construction, pedestrian ramps, or bike lanes on existing roads, and routine replacement of damaged pavement such as pothole repair are not subject to additional stormwater treatment requirements. However, other requirements, including SWPPP documents/permits (see Chapter 3), incorporation of appropriate source controls, may still apply.

► NUMERIC SIZING REQUIREMENTS

Per the Municipal Permit, projects subject to PDP requirements are subject to designing and installing treatment control (numerically-sized) BMP's (TCBMP's) to remove/filter pollutants from new/redevelopment projects. Depending on the site drainage and soil characteristics of a project, anticipated pollutants, impairments to downstream water bodies the applicant has a broad menu of TCBMP's to choose from. However, a basic premise is to choose TCBMP's that more effective at removing the anticipated pollutants than using TCBMP's with low effectiveness. Using more than one TCBMP in series (treatment train) has benefits is satisfying

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numeric sizing requirements. The selection and sizing of TCBMP's are subject to either volume-based or flow-based criteria. For more detailed information on treatment control requirements, refer to Section 2.

► WAIVERS FROM NUMERIC SIZING

In accordance with the Municipal Permit, the city may consider a project to be waived from numeric sizing criteria for stormwater treatment **only** if all available treatment facilities have been considered and demonstrated to be **infeasible**. If a waiver is granted, it does not relieve the applicant from the requirement to prepare and submit a SWMP for the project. A waiver from numeric sizing does not relieve the applicant from satisfying Standard Storm Water (minimum Low Impact Development) requirements or hydromodification requirements.

To apply for a waiver, the applicant must submit a request to the City Engineer. The applicant shall include the project name, project number and detailed narrative explanations on all available treatment control measures considered and why each measure cannot be incorporated to justify why numeric sizing criteria cannot be achieved on the project. If the City Engineer cannot make the necessary findings that numeric treatment is infeasible, a waiver will be denied. If a waiver is granted, the city is required to inform the Water Board within 5 days of granting a waiver. Even if a waiver is granted, the applicant is still required to satisfy all other SUSMP requirements—including Standard Stormwater Requirements such as incorporating site designs to minimize imperviousness and implement source control BMPs per Appendix 1.

► SPECIAL CIRCUMSTANCES

Please note that, in most circumstances, project designs usually can be shown to implement and satisfy treatment control requirements. However, the use of more effective TCBMP's or IMP's on certain projects such as: retrofit of existing drainage systems, sites smaller than one acre in pedestrian-oriented developments, or widened portions of roadways, sometimes presents special challenges. In these special situations, applicants should see the discussion of "Selection of Stormwater Treatment Facilities" in Section 2 and evaluate the options described on page 27 in order (depending on the specific characteristics of the project and as approved by the city). Unless waived, all the options listed must meet applicable numeric sizing criteria per the Municipal Permit. For these challenging circumstances, all applicable hydromodification requirements would still apply for the project.

► FLOW CONTROL (HYDRMODIFICATION) REQUIREMENTS

The previous Municipal Permit, issued in 2001, included a requirement to control the post-development peak storm water runoff rates and velocities to maintain or reduce pre-development downstream erosion and protect stream habitat. The 2007 Municipal Permit includes, in addition to this ongoing requirement, a new requirement to develop a hydromodification management plan (HMP) to identify and define a methodology and performance criteria to ensure flow rates and durations do not exceed pre-project runoff where increased runoff could cause erosion or other significant adverse impacts to beneficial uses.

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As required by the Municipal Permit, the Copermittees, including Carlsbad, have adopted final hydromodification criteria. To see how hydromodification criteria is incorporated into the city's development review process, refer to Section 2. For more information on the technical details of the HMP please refer to the final HMP which can be viewed or downloaded from www.projectcleanwater.org.

In accordance with the Municipal Permit and final HMP, in addition to satisfying LID and treatment control (numeric) requirements, projects subject to PDP requirements might be required to implement measures so that post-development runoff rates and durations do not exceed pre-project conditions (hydromodification controls).

To understand if and how hydromodification will affect your project, please refer to Section 2.

Compliance Process at a Glance

For the applicant, here are general steps on how to achieve stormwater compliance:

1. Review the instructions in this SUSMP before you prepare your tentative map, preliminary site plan, building site plan, drainage plan, SWMP, and landscape plan.
2. Complete the SWSQ to determine whether your project is subject to Standard Stormwater Requirements or PDP requirements. For projects subject to Standard Stormwater Requirements, make sure your construction drawings (SUSMP drawings) incorporate the requirements outlined in Section 1.
3. For complex projects consider submitting for a Preliminary Review for the city to identify preliminary issues on concept exhibits, including water quality issues.
4. Discuss requirements and/or process during a pre-application meeting with city staff.

Discretionary applications

5. If your project is subject to PDP requirements, with your Discretionary Permit application, prepare and submit a *preliminary* SWMP as part of the application. This will assist in providing a complete application for city review. If not subject to PDP requirements, then ensure your project exhibits (SUSMP Drawings) satisfy the Standard Stormwater Requirements in Section 1.
6. Develop your detailed project design drawings (SUSMP Drawings), incorporating the water quality features described in your Discretionary Permit(s) and preliminary SWMP, if any. Significant changes in approach to water quality (per the preliminary SWMP) may trigger further review by the city to approve it.

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If no Discretionary required

7. If not subject to PDP requirements, then ensure your detailed design satisfies the Standard Stormwater (minimum LID) Requirements.

Remaining steps apply to all PDP's:

8. Assemble a SWMP per Section 3. Identify if your project is subject to flow control (hydromodification) requirements. Size your TCBMP/IMP's per Section 4. Size your flow control (hydromodification) facilities per Section 4 or per the HMP. As part of the SWMP, include a single-sheet post-construction BMP plan, list each stormwater compliance feature and facility and the plan sheet where it appears. Include a Stormwater Facility Operation and Maintenance Plan. Refer to the SWMP requirements checklist for further information.
9. Prior to plan approvals, execute a city standard Permanent Stormwater Quality BMP Maintenance Agreement that records against the property or lease ensuring treatment BMP's are maintained, inspected and replaced, as necessary.
10. To ensure water quality compliance, property owner shall monitor, maintain and replace (as necessary) stormwater facilities during construction and following construction in accordance with required warranties.
11. Following construction, formally transfer responsibility for maintenance to the owner.
12. The owner must periodically verify stormwater treatment facilities are properly maintained and keep a maintenance record for at least 5 years. In accordance with the Permanent Stormwater Quality BMP Maintenance Agreement, the owner will be subject to submitting to the city, annual verification that treatment BMP's and/or flow control facilities have been inspected, are properly working or are replaced to ensure their effectiveness at removing pollutants or concern.

For projects subject to PDP requirements, preparation of a complete and detailed SWMP is the key to cost-effective stormwater compliance and expeditious review of your project. Instructions for preparing your SWMP are in Section 3.

References and Resources:

- [RWQCB Order R9-2007-0001 \(Municipal Permit\)](#)
- [Project Clean Water web page](#)

Identify Pollutants, BMP sizing and selection

Technical background and explanations of policies and design requirements

Provision D.1.d. of the Municipal Permit requires Copermittees to regulate projects that are subject to Priority Development Project requirements. As required the city reviews plans and documents to ensure projects:

1. Reduce discharges of pollutants to the maximum extent practicable.
2. Prevent runoff discharges from causing or contributing to a violation of water quality standards.

To enhance the development review process, the Copermittees have prepared a Low Impact Development (LID) design procedure (Section 4) that ensures consistent and thorough implementation of the Regional Water Board's requirements. This Section explains the technical background of the LID approach and how it was derived.

However, before BMP's are selected for a project, the applicant must first understand the watershed the project is located in, water bodies that may be impaired, and type of pollutants associated with different types of development/land uses.

Water-Quality Regulations

Provision D.1 of the Municipal Permit requires the Copermittees to condition development approvals on incorporation of specified stormwater controls.

Provision D.1 of the Municipal Permit requires applicable new developments and redevelopments:

SECTION 2: IDENTIFY POLLUTANTS, BMP SIZING AND SELECTION

- Design the site to conserve natural areas, existing trees and vegetation and soils, to maintain natural drainage patterns, to minimize imperviousness, to detain runoff, and to infiltrate runoff where feasible
- Cover or control sources of stormwater pollutants
- Treat runoff prior to discharge. Provision E.10 states: “Urban runoff treatment and/or mitigation must occur prior to the discharge of urban runoff to receiving waters. Federal regulations at 40 CFR 131.10(a) state that in no case shall a state adopt waste transport or waste assimilation as a designated use for any waters of the U.S.”
- Ensure runoff does not exceed pre-project peaks and durations where increases could affect downstream habitat or other beneficial uses
- Maintain treatment and flow-control facilities

The city maintains a database to track approved installations of treatment control BMP facilities and to verify these facilities are maintained. The city’s annual report to the Regional Water Board includes a list of development projects subject to SUSMP conditions and descriptions of those projects that:

- Used hydrologic controls used to meet HMP requirements, including a description of the controls;
- Received a waiver from SUSMP criteria;

The Copermittees must also report the number of violations and enforcement actions taken upon development projects. The city’s programs are subject to audit by the Regional Water Board.

The city—not the Regional Water Board or its staff—are charged with ensuring development projects comply with the D.1 requirements. Regional Water Board staff sometimes review stormwater controls and hydromodification impacts in connection with applications for Clean Water Act Section 401 water-quality certification, which is required for projects that involve work, such as dredging or placement of fill, within streams, creeks, or other waters of the US.

► MAXIMUM EXTENT PRACTICABLE

[Clean Water Act Section 402\(p\)\(3\)\(iii\)](#) sets the standard for stormwater controls as “maximum extent practicable,” but doesn’t define that term. As implemented, “maximum extent practicable” is ever-changing and varies with conditions.

Many stormwater controls, including LID facilities, have proven to be practicable in most site development projects. To achieve fair and effective implementation, criteria and guidance, requirements for controls must be detailed and specific—while also offering the right amount of flexibility or exceptions for special cases. The Municipal Permit includes various standards, including hydrologic criteria, which have been found to comprise “maximum extent

practicable.” This SUSMP is to be continuously improved and refined based on the experience of the city, with input from land developers, development professionals, and other municipalities. By following the SUSMP, applicants can ensure their project design meets “maximum extent practicable.”

► BEST MANAGEMENT PRACTICES

Clean Water Act Section 402(p) and USEPA regulations (40 CFR 122.26) specify a municipal program of “management practices” to control stormwater pollutants. **Best Management Practice (BMP)** refers to any kind of procedure, activity or device designed to minimize the quantity of pollutants that enter the storm drain system. BMPs are typically used in place of assigning numeric effluent limits. The criteria for source control BMPs and treatment and flow-control facilities are crafted to fulfill “maximum extent practicable.”

To minimize confusion, this guidebook refers to “facilities,” “features,” “treatment control BMP’s (TCBMP’s)”, “Integrated Management Practices (IMP’s)”, or “controls” to be incorporated into development projects. All of these are BMPs.

► IMPERVIOUSNESS AND RUNOFF

[Schueler \(1995\)](#) proposed **imperviousness** as a “unifying theme” for the efforts of planners, engineers, landscape architects, scientists, and local officials concerned with urban watershed protection. Schueler argued (1) that imperviousness is a useful indicator linking urban land development to the degradation of aquatic ecosystems, and (2) imperviousness can be quantified, managed, and controlled during land development.

Imperviousness has long been understood as the key variable in urban hydrology. Peak runoff flow and total runoff volume from small urban catchments is usually calculated as a function of the ratio of impervious area to total area (**rational method**). The ratio correlates to the runoff factor, usually designated “C”. Increased flows resulting from urban development tend to increase the frequency of small-scale flooding downstream.

Imperviousness links urban land development to degradation of aquatic ecosystems in two ways.

First, the combination of paved surfaces and piped runoff efficiently collects urban pollutants and transports them, in suspended or dissolved form, to surface waters. These pollutants may originate as airborne dust, be washed from the atmosphere during rains, or may be generated by automobiles and outdoor work activities.

Second, increased peak flows and runoff durations typically cause erosion of stream banks and beds, transport of fine sediments, and disruption of aquatic habitat. Measures taken to control stream erosion, such as hardening banks with riprap or concrete, may permanently eliminate habitat. By reducing infiltration to groundwater, imperviousness may also reduce dry-weather stream flows.

Imperviousness has two major components: rooftops and transportation (including streets, highways, and parking areas). The transportation component is usually larger and is more likely to be **directly connected** to the storm drain system.

The effects of imperviousness can be mitigated by disconnecting impervious areas from the drainage system and by encouraging detention and retention of runoff near the point where it is generated. Detention and retention reduce peak flows and volumes and allow pollutants to settle out or adhere to soils before they can be transported downstream.

Pollutants of Concern

Provision D.1.d.(3) of the Municipal Permit requires each Copermittee to develop and implement a procedure for pollutants of concern to be identified for each Priority Development Project. The Copermittees have considered this requirement jointly and have determined the LID design procedures in Sections 3 and 4 of this SUSMP fully address the need to identify pollutants of concern insofar as that identification may affect the selection of source control BMPs, treatment control and integrated management practice facilities.

Documentation of the approach to identifying pollutants of concern and selecting BMPs and facilities follows.

► GROUPING OF POTENTIAL POLLUTANTS OF CONCERN

Urban runoff from a developed site has the potential to contribute pollutants, including oil and grease, suspended solids, metals, gasoline, pesticides, and pathogens to the storm water conveyance system and receiving waters. For the purposes of identifying pollutants of concern and associated storm water BMPs, pollutants are grouped in nine general categories as follows:

- **Sediments** are soils or other surficial materials eroded and then transported or deposited by the action of wind, water, ice, or gravity. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth.
- **Nutrients** are inorganic substances, such as nitrogen and phosphorus. They commonly exist in the form of mineral salts that are either dissolved or suspended in water. Primary sources of nutrients in urban runoff are fertilizers and eroded soils. Excessive discharge of nutrients to water bodies and streams can cause excessive aquatic algae and plant growth. Such excessive production, referred to as cultural eutrophication, may lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual death of aquatic organisms.
- **Metals** are raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. Primary sources of metal pollution in storm water are typically commercially available metals and metal products. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. At low concentrations naturally occurring in soil, metals are not toxic. However, at higher

SECTION 2: IDENTIFY POLLUTANTS, BMP SIZING AND SELECTION

concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns, regarding the potential for release of metals to the environment, have already led to restricted metal usage in certain applications.

- **Organic compounds** are carbon-based. Commercially available or naturally occurring organic compounds are found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life.
- **Trash** (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash & debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter can create a high biochemical oxygen demand in a stream and thereby lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.
- **Oxygen-Demanding Substances** includes biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds. Proteins, carbohydrates, and fats are examples of biodegradable organic compounds. Compounds such as ammonia and hydrogen sulfide are examples of oxygen-demanding compounds. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions.
- Primary sources of **oil and grease** are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids. Introduction of these pollutants to the water bodies are very possible due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality.
- **Bacteria and Viruses** are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically caused by the transport of animal or human fecal wastes from the watershed. Water, containing excessive bacteria and viruses can alter the aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

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- **Pesticides** (including herbicides) are chemical compounds commonly used to control nuisance growth or prevalence of organisms. Excessive application of a pesticide may result in runoff containing toxic levels of its active component.

► IDENTIFYING POLLUTANTS OF CONCERN BASED ON LAND USES

Table 2-1 associates pollutants with the categories of Priority Development Projects. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

► WATERSHEDS WITH SPECIAL POLLUTANT CONCERNS

Local receiving water conditions may require specialized attention. The four local conditions to consider include:

- Ocean waters designated as an “Area of Special Biological Significance” (ASBS)
- Pacific Ocean as described in Mello I the Local Coastal Program
- 303(d) listed waters; and
- Waters with established TMDLs.

SECTION 2: IDENTIFY POLLUTANTS, BMP SIZING AND SELECTION

TABLE 2-1. ANTICIPATED AND POTENTIAL Pollutants Generated by Land Use Type.

	General Pollutant Categories								
Priority Project Categories	Sediment	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development >one acre	P(1)	P(1)	X	P(2)	X	P(5)	X	P(3)	P(5)
Heavy Industry	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	P(1)
Hillside Development >5,000 ft ²	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X	X	P(1)
X = anticipated P = potential (1) A potential pollutant if landscaping exists on-site. (2) A potential pollutant if the project includes uncovered parking areas. (3) A potential pollutant if land use involves food or animal waste products. (4) Including petroleum hydrocarbons. (5) Including solvents.									

SECTION 2: IDENTIFY POLLUTANTS, BMP SIZING AND SELECTION

The State Water Resources Control Board's California Ocean Plan identifies thirty-four locations along the California coast as **Areas of Special Biological Significance (ASBS)**. The Ocean Plan prohibits the discharge of wastes into these locations, thus barring discharges associated with industrial activities, publicly owned treatment works, and other traditional point discharges. In 2004 the SWRCB informed affected municipal stormwater programs throughout the state that urban runoff contained a waste and was subject to the prohibition. At the date of this SUSMP, there are no locations listed that affect projects in Carlsbad.

The Municipal Permit identifies several receiving waters as impaired for constituents or water quality effects pursuant to **Section 303(d)** of the Clean Water Act. Placement of a water onto the list requires the Regional Board to make further analysis of the impairment and development of total maximum daily loads (TMDLs) for addressing the impairment. The 303(d) listing in itself does not demand that a project proponent select BMPs on the basis of the impairment; however, the project proponent should be cognizant of the impairment and the future implications a TMDL might have upon the proposed land use.

Once a TMDL is established it may impose conditions on development either through an implementation plan and schedule for the listed water, or through special conditions required of the municipality affected by the numeric criteria of the TMDL. At this time, several 303(d) listings in San Diego County are at various stages of TMDL development with only four TMDLs having been adopted by the Regional Board. As this time, no TMDL's have been established within Carlsbad. However, there are approximately 190 pending TMDLs in the county.

The **adopted TMDLs** in the San Diego area include:

- Diazinon, copper, lead, and zinc for Chollas Creek;
- Nitrogen and phosphorous for Rainbow Creek;
- Dissolved copper for Shelter Island Yacht Basin;
- Indicator bacteria for beaches and creeks in the San Diego Region.

In the early design stages, the applicant should meet with city staff to determine if any project characteristics or watershed characteristics affect selection and design of BMPs. Except in rare circumstances, the use of the LID Design Guide (Section 4) and the Stormwater Pollutant Sources/Source Control Checklist (Appendix 1) will ensure your project complies with all stormwater requirements.

Selection of Permanent Source Control BMPs

Based on identification of potential pollutants of concern associated with various types of facilities, refer to the Stormwater Pollutant Sources/Source Control Checklist (Appendix 1) of "maximum extent practicable" source controls associated with each facility type. This approach ensures appropriate BMPs are applied to potential sources of each pollutant of concern.

Selection of Stormwater Treatment Facilities

See Table 2-2 that groups pollutants of concern by how easily they are removed by various treatment processes.

For a general comparison of how various types of treatment facilities perform for each group of pollutants see Table 2-3.

TABLE 2-2. GROUPING OF POTENTIAL POLLUTANTS of Concern by fate during stormwater treatment

Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

TABLE 2-3. GROUPS OF POLLUTANTS and relative effectiveness of treatment facilities

Pollutants of Concern	Bioretention Facilities (LID)	Settling Basins (Dry Ponds)	Wet Ponds and Constructed Wetlands	Infiltration Facilities or Practices (LID)	Media Filters	Higher-rate biofilters*	Higher-rate media filters*	Trash Racks & Hydro-dynamic Devices	Vegetated Swales
Coarse Sediment and Trash	High	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Medium	Low	Medium
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low	Low

*See page 27 for a discussion of selection of treatment facilities in special situations.

Based on these tables, the following types of facilities are appropriate for treatment of runoff potentially containing most pollutants of concern. If sized per the LID design guide (Section 4), these types of facilities can be used for stormwater treatment and hydromodification flow control for several land uses in many watersheds, except where site-specific constraints make them infeasible.

- Bioretention facilities and media filters that detain stormwater and filter it slowly through soil or sand (sized with a surface area at least 0.04 times the effectively impervious tributary area for water quality treatment – a larger sizing factor is required to provide hydromodification flow control).

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- Extended detention basins, wet ponds, and wetlands or other facilities using settling (sized to detain a volume equivalent to runoff from the tributary area generated by the 85th percentile 24-hour event water quality event – greater capacity required to provide hydromodification flow control).
- Infiltration facilities or practices, including dry wells, pervious pavement, infiltration trenches, infiltration basins, and other facilities that infiltrate runoff to native soils (sized to detain and infiltrate a volume equivalent to the 85th percentile 24-hour event water quality runoff event – greater capacity required to provide hydromodification flow control).

The recommended design procedure in Section 4 integrates LID practices—optimizing the site design, using pervious surfaces, and dispersing of runoff to adjacent pervious areas—with the use of infiltration facilities, detention basins, and bioretention facilities to meet the complex requirements of the Municipal Permit including LID requirements, treatment control (numeric) requirements, and flow-control requirements in a cost-effective, unified design.

Oil/water separators (“water quality inlets”), storm drain inlet filters, and hydrodynamic separators, including vortex separators and continuous deflection separators (“CDS units”), are less effective means of stormwater treatment, although they may be used in series with more effective facilities.

Underground vaults typically lack the detention time required for settling of fine particles associated with stormwater pollutants, unless pre-treatment BMP is included in the design. They also require frequent maintenance and may retain stagnant water, potentially providing harborage for mosquitoes. Because vaults may be “out of sight, out of mind,” experience shows that the required maintenance may not occur. If these facilities are selected incorporate measures that address the above vector and access issues

Lack of space, in itself, is not a suitable justification for using a less-effective treatment on a development site, because the uses of the site and the site design can be altered as needed to accommodate bioretention facilities or planter boxes. In most cases, these effective facilities can be fit into required landscaping setbacks, easements, or other unbuildable areas.

Where possible, drainage to inlets, and drainage away from overflows and underdrains, should be by gravity. Where site topography makes it infeasible to accommodate gravity-fed facilities in the project design, the design flow may be captured in a vault or sump and pumped via force main to an effective facility.

The following situations sometimes present special challenges:

- Portions of sites which are not being developed or redeveloped, but which must be retrofit to meet treatment requirements in accordance with Provision D.1.d.(1)(a) which states in part: “Where redevelopment results in an increase of, or replacement of, more than fifty percent of the impervious surface of a previously existing development, the numeric sizing criteria applies to the entire development.”

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- Sites smaller than one acre approved for development or redevelopment as part of a municipality's stated objective to preserve or enhance a pedestrian-oriented "smart-growth" type of urban design.
- Private/Public Streets
- Roadway widening projects.

In these special situations, the following types of facilities should each be evaluated in priority order (depending on the specific characteristics of the site and as determined by the city) until a feasible design is found.

1. Bioretention areas or planter boxes fed by gravity.
2. Capture of the design flow in a vault or sump and pumping to bioretention areas or planter boxes.
3. A subsurface sand or media filter with a maximum design surface loading rate of 5 inches per hour and a minimum media depth of 18 inches. The sand surface must be made accessible for periodic inspection and maintenance (for example, via a removable grating).
4. A higher-rate surface biofilter, such as a tree-pit-style unit. The grading and drainage design should minimize the area draining to each unit and maximize the number of discrete drainage areas and units.
5. A higher-rate vault-based filtration unit (for example, vaults with replaceable cartridge filters filled with inorganic media).

Proprietary Devices

Many currently available proprietary devices do not meet municipalities' requirements when used alone for stormwater treatment. Consult with city staff before proposing these devices.

Many proprietary stormwater treatment devices are currently marketed, and new brands will be introduced. Applicants and applicants' engineers and design professionals should review with city staff any proposals for using proprietary devices for stormwater treatment before they commence work on preliminary site layout, drainage plans, storm water management plans, grading/improvement plans, or landscape plans.

Unless numeric waivers have been granted by the city, or the project has been deemed exempt from hydromodification, the challenges above do not relieve the applicant from satisfying the applicable requirements of this SUSMP whether they pertain to minimum LID standards, treatment control (numeric) or flow control (hydromodification) requirements.

Treatment Control (Numeric) Requirements

Per the Municipal Permit, all PDP projects must (in addition to the other applicable requirements) satisfy the numeric sizing requirements. This section outlines the numerical sizing requirements used to size treatment control BMP's (TCBMP's).

For projects not subject to hydromodification requirements or you electing to not use the unified LID design procedure in Section 4, then this section explains the numeric BMP sizing approach. To demonstrate how your project also meets treatment control (numeric) requirements per the Municipal Permit, there are two approaches to design treatment control facilities—volume-based and flow-based.

Most runoff is produced by frequent storms of small or moderate intensity and duration. Treatment facilities are designed to treat smaller storms and the first flush of larger storms—approximately 80% of average annual runoff.

If your project is subject to treatment control (numeric sizing) requirements and flow-control (hydromodification) you have a choice to either demonstrate separately how your projects meet treatment control (per this section) and the flow-control (hydromodification) or you could use the unified LID design guide in Section 4 that includes a sizing approach that satisfies all three stormwater objectives, if they apply.

► VOLUME-BASED APPROACH

Volume-based facilities must be designed to infiltrate, filter, or treat the volume of runoff produced from a 24-hour 85th percentile storm event as determined from the County of San Diego's 85th Percentile Precipitation Isoplethial Map. For a copy of this map, refer to the County Hydrology Manual. As shown on the map, rainfall depths vary from about 0.55" to 1.55".

► FLOW-BASED APPROACH

For flow-based facilities, the Municipal Permit specifies the rational method be used to determine flow. The rational method uses the equation

$$Q = CiA, \text{ where}$$

$$Q = \text{flow}$$

$$C = \text{weighted runoff factor between 0 and 1}$$

$$i = \text{rainfall intensity}$$

$$A = \text{area}$$

The Municipal Permit identifies two alternatives for calculating rainfall intensity:

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1. the 85th percentile rainfall intensity times two, or
2. 0.2 inches per hour.

It is typically found that both methods yield similar results. The 0.2 inches per hour rainfall intensity should be used for sizing flow-based treatment facilities within the Copermittes' jurisdiction.

The 0.2 inches per hour criterion is the basis for a **consistent countywide sizing factor** for bioretention facilities when used for stormwater treatment only (i.e., not for flow control). The factor is based on maintaining a minimum percolation rate of 5 inches per hour through the engineered soil mix. The sizing factor is the ratio of the design intensity of rainfall on tributary impervious surfaces (0.2 inches/hour) to the design percolation rate in the facility (5 inches/hour), or **0.04** (dimensionless).

Flow-Control (Hydromodification) Requirements

In accordance with the Municipal Permit and final HMP, in addition to satisfying LID and treatment control (numeric) requirements, projects subject to PDP requirements might be required to implement measures so that post-development runoff rates and durations do not exceed pre-project conditions (hydromodification controls).

To determine if a proposed project must implement hydromodification controls, refer to the HMP Applicability Determination in Figure 2-1 (subject to expanded narrative in SUSMP).

If HMP is applicable to the project, there are several more figures to be completed. Below, Figures 2-2 through 2-5 will help the applicant assess the lower flow (storm) threshold to be used. The lower flow threshold (.1Q₂, .3Q₂, .5Q₂) will impact either the sizing factors for IMP sizing, the pond sizer in the Calculator, or the criteria for the HSPF software chosen to address flow control (hydromodification).

This subsection includes excerpts from the HMP. When more detailed information is needed, refer to the HMP (see www.projectcleanwater.org). The HMP shall be used by the applicant as a supporting document to this SUSMP to help understand HMP criteria, critical shear flow analysis, channel assessments, and HMP facility sizing needs.

► HYDROMODIFICATION APPLICABILITY DETERMINATION

The applicant, for all projects subject to PDP requirements, shall complete the HMP Applicability Determination, which helps identify potential exemptions from flow control (hydromodification) requirements (HMP exemption). Once a potential HMP exemption is identified, the applicant must review the expanded narrative below and provide the supplemental information to the city as necessary to certify a project is exempt from HMP. If the information cannot be provided, then the applicant must demonstrate how this project satisfies HMP requirements per this SUSMP.

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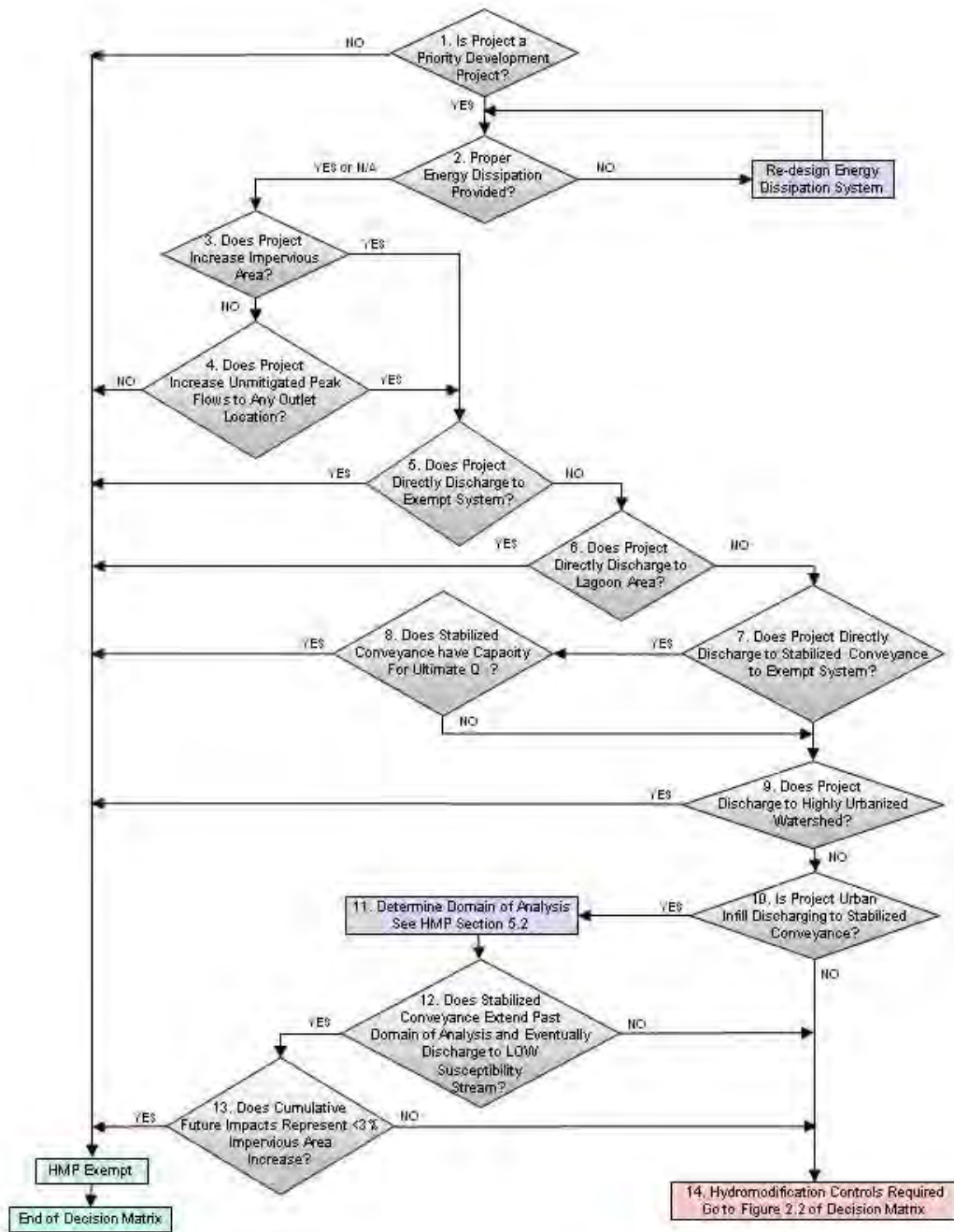


FIGURE 2-1. HMP Applicability Determination*

*refer to expanded HMP exemption criteria below for justifications required on each node

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For PDP projects, in addition to completing the SWSQ, this Applicability Determination shall be submitted to the city during project submittal. In general, hydromodification controls would only be required if the project increases impervious area or unmitigated peak flow rates as compared to pre-project conditions. However, using the Applicability Determination, will help identify potential exemptions whether the project is subject to HMP requirements or not.

In general, if the proposed project decreases the pre-project impervious area and peak flows to each discharge location, then a flow-duration analysis is implicitly not required. If continuous simulation flow-frequency and flow duration curves were developed for such a scenario, the unmitigated post-project flows and durations would be less as compared to pre-project curves.

Even if hydromodification is not required on a project, it should be noted that all projects subject to PDP requirements will still be subject to the Standard Storm Water requirements (minimum LID) and treatment control (numeric) requirements per the Municipal Permit and this SUSMP.

Proposed exemptions for projects discharging runoff directly to the Pacific Ocean, San Diego Bay or to hardened conveyance systems which transport runoff directly to the Pacific Ocean or San Diego Bay are referred to the Municipal Permit. Per the Municipal Permit, hardened conveyance systems can include existing concrete channels, storm drain systems, etc.

The Municipal Permit also contains language to support exemptions for projects located in highly urbanized areas where the impervious percentage exceeds 70 percent (as calculated for the sub-watershed between the project outfall downstream to the exempt receiving water).

► EXPANDED HYDROMODIFICATION EXEMPTION CRITERIA PER HMP

Below are expanded narrative descriptions for Figure 2-1 on how exemptions, per the final HMP, are made by the city:

- Figure 2-1, Node 1 – Hydromodification mitigation measures are only required if the proposed project is a Priority Development Project.
- Figure 2-1, Node 2 – Properly designed energy dissipation systems are required for all project outfalls to unlined channels. Such systems should be designed in accordance with the County of San Diego's Drainage Design Manual to ensure downstream channel protection from concentrated outfalls.
- Figure 2-1, Nodes 3 and 4 – Projects may be exempt from hydromodification criteria if the proposed project reduces the pre-project impervious area and if unmitigated post-project outflows (outflows without detention routing) to each outlet location are less as compared to the pre-project condition. The pre and post-project hydrologic analysis should be conducted for the 2 and 10-year design storms and follow single-event

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methodology set forth in the San Diego Hydrology Manual. This scenario may apply to redevelopment projects in particular.

- Figure 2-1, Node 5 – Potential exemptions may be granted for projects discharging runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt river system (detailed in Table 2-4), or an exempt reservoir system (detailed in Table 2-5).
- Figure 2-1, Node 6 – For projects discharging runoff directly to a tidally-influenced lagoon, potential exemptions may also be granted. Exemptions related to runoff discharging directly to tidally-influenced areas were drafted based upon precedent set in the Santa Clara HMP. Regarding the potential exemption, additional analysis would be required to assess the effects of the freshwater / saltwater balance and the resultant effects on lagoon-system biology. This assessment, which would be required by other permitting processes such as the Army Corps of Engineers, California Department of Fish and Game, etc., must be provided by a certified biologist or other specialist as approved by the governing municipality. Such discharges would include an energy dissipation system (riprap, etc.) designed to mitigate 100-year outlet velocities based upon a free outfall condition. Such a design would be protective of the channel bed and bank from an erosion standpoint.
- Figure 2-1, Nodes 7 and 8 – For projects discharging runoff directly to a hardened conveyance or rehabilitated stream system that extends to exempt receiving waters detailed in Node 5, potential exemptions from hydromodification criteria may be granted. Such hardened or rehabilitated systems could include existing storm drain systems, existing concrete channels, or stable engineered unlined channels. To qualify for this exemption, the existing hardened or rehabilitated conveyance system must continue uninterrupted to the exempt system. In other words, the hardened or rehabilitated conveyance system cannot discharge to an unlined, non-engineered channel segment prior to discharge to the exempt system. Additionally, the project proponent must demonstrate that the hardened or rehabilitated conveyance system has capacity to convey the 10-year ultimate condition flow through the conveyance system. The 10-year flow should be calculated based upon single-event hydrologic criteria as detailed in the San Diego County Hydrology Manual.
- Figure 2-1, Node 9 – As allowed per the Municipal Permit, projects discharging runoff to a highly urbanized watershed (defined as impervious percentage greater than 70 percent) may be eligible for an exemption from hydromodification criteria. The impervious area is calculated for the sub-watershed between the project outfall and the exempt water body.

Watershed impervious area calculations for this potential exemption, in which a project discharges to a watershed with an existing impervious area greater than 70 percent, will be measured between the project site discharge location and the connection to a downstream exempt receiving conveyance system, such as the Pacific Ocean, San Diego Bay, or an exempt river system. If a tributary area connects with the main line drainage

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path between the project site and the exempt system, then the entire watershed area contributing to the tributary shall be included in the calculation. Initial review of County land use indicates that this exemption will likely only apply in a limited number of urbanized coastal areas.

Percent imperviousness will be calculated based on an area-weighted average of impervious areas associated with commercial, industrial, single-family residential, multi-family residential, open space, and other miscellaneous areas (schools, churches, etc.) representative for the watershed. Representative percent imperviousness values for each land use type may correspond to values recommended in Table 3-1 of the County of San Diego's Hydrology Manual and detailed below or by more specific representative percent impervious calculations (using GIS, etc.), which are often required to represent impervious area percentages for park, school and church sites.

- Figure 2-1, Nodes 10 through 13 – For urban infill projects discharging runoff to an existing hardened or rehabilitated conveyance system, potential limited exemptions from hydromodification criteria may apply where the existing impervious area percentage in the watershed exceeds 40 percent. For the potential exemption application, the domain of analysis must be determined and the existing hardened or rehabilitated conveyance system must extend beyond the downstream terminus of the domain of analysis. The hardened or rehabilitated conveyance system must discharge to a receiving channel with a Low potential for channel susceptibility for this exemption to be granted. The channel susceptibility is determined using the Southern California Coastal Water Research Project (SCCWRP) tool. Finally, continuous simulation sensitivity analysis shows that an exemption could only be granted if the potential future development impacts in the watershed would increase the watershed's impervious area percentage by less than 3 percent (as compared to the existing condition in the year 2010). If the potential future cumulative impacts in the watershed could increase the impervious area percentage by more than 3 percent (as compared to existing condition), then no exemption could be granted based on this item. Watershed impervious area calculations for this potential exemption, in which a project discharges to a watershed with an existing impervious areas greater than 40 percent, will be measured upstream from the outfall of the urban conveyance system (to an unarmored or non-engineered channel) to the contributing watershed boundary (the entire watershed contributing to the discharge outfall).

Percent imperviousness will be calculated based on an area-weighted average of impervious areas associated with commercial, industrial, single-family residential, multi-family residential, open space, and other miscellaneous areas (schools, churches, etc.) representative for the watershed. Representative percent imperviousness values for each land use type may correspond to values recommended in Table 3-1 of the County of San Diego's Hydrology Manual and detailed below or by more specific representative percent impervious calculations (using GIS, etc.), which are often required to represent impervious area percentages for park, school and church sites.

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Exemptions related to runoff discharging directly to certain river reaches were initially based upon the majority TAC opinion that such river reaches were depositional (aggrading) and that the effects of cumulative watershed impacts to these reaches is minimal. Subsequent justifications for the river reach exemptions were the result of a flow duration curve analysis for the San Diego River.

Potential river reaches that would be exempt from hydromodification criteria include only those reaches for which the contributing drainage area exceeds 100 square miles and which have a 100-year design flow in excess of 20,000 cfs. For reference, proposed Caltrans HMP criteria allows for river/creek exemptions for drainage areas of only 10 square miles.

Per recommendations from members of the TAC, San Diego river systems meeting the drainage area and peak flow criteria are typically aggrading (depositional) and have very wide floodplain areas when in the natural condition. In all cases, river reaches meeting the drainage area and peak flow criteria are located downstream of large reservoir systems which effectively block outflows for most storm events. In addition, the river systems meeting these criteria typically have very low gradients. The combination of low gradients, significant peak flow attenuation, and wide floodplain areas translate to a low potential for channel erosion at the upper limit of the proposed geomorphic flow range (10-year flow event).

All exempt river reaches, which are presented in Table 2-4, have drainage areas in excess of 100 square miles and 100-year flow rates in excess of 20,000 cfs. In addition, all proposed river reaches are subject to significant upstream reservoir flow regulation, have wide floodplain or stabilized channel areas, and low gradients. This combination of factors, in association with field observations and years of historical perspective from the TAC members, justifies exemptions for direct discharges to the exempt river reaches provided that properly sized energy dissipation is provided at the outfall location.

TABLE 2-4. Summary of Exempt River Reaches in San Diego County

River	Downstream Limit	Upstream Limit
Otay River	Outfall to San Diego Bay	Lower Otay Reservoir Dam
San Diego River	Outfall to Pacific Ocean	Confluence with San Vicente Creek
San Dieguito River	Outfall to Pacific Ocean	Lake Hodges Dam
San Luis Rey River	Outfall to Pacific Ocean	Upstream river limit of Basin Plan subwatershed 903.1 upstream of Bonsall and near Interstate 15
Sweetwater River	Outfall to San Diego Bay	Sweetwater Reservoir Dam

Table 2-5 provides a summary of exempt reservoirs in San Diego County. Large reservoirs can be exempt systems from a hydromodification standpoint since reservoir storm water inflow velocities are naturally mitigated by the significant tailwater condition in the reservoir. HMP exemptions would only be granted for projects discharging runoff directly to the exempt reservoirs. Each municipality must define —direct discharge|| based on the project site conditions. To qualify for the potential exemption, the outlet elevation must be at or below either the normal operating water surface elevation or the reservoir spillway elevation and properly designed energy dissipation must be provided.

TABLE 2-5. Summary of Exempt Reservoirs in San Diego County

Reservoir	Watershed
Barrett Lake	Tijuana River
El Capitan Reservoir	San Diego River
Lake Dixon	Escondido Creek
Lake Henshaw	San Luis Rey River
Lake Hodges	San Dieguito River
Lake Jennings	San Diego River
Lake Murray	San Diego River
Lake Poway	San Dieguito River
Lake San Marcos	San Marcos Creek
Lake Wohlford	Escondido Creek
Loveland Reservoir	Sweetwater River
Lower Otay Reservoir	Otay River
Miramar Lake	Los Penasquitos Creek
San Vicente Reservoir	San Diego River
Sweetwater Reservoir	Sweetwater River
Upper Otay Reservoir	Otay River

The final exemption category focuses on small urban infill projects where the potential for future cumulative watershed impacts is minimal.

Urban infill projects may be exempt from HMP criteria if:

1. The potential future development impacts within the sub-watershed, as measured from the entire sub-watershed area draining to the existing conveyance system outfall, would not increase the composite impervious area percentage of the sub-watershed by more than 3 percent.
2. The project discharges runoff to an existing hardened or rehabilitated conveyance system (storm drain, concrete channel, or engineered vegetated channel) that extends beyond the Domain of Analysis determined for the project site, and
3. The stabilized conveyance system eventually discharges to a channel with a Low susceptibility to erosion, as designed by the SCCWRP channel assessment tool.

► **HYDROMODIFICATION DECISION MATRIX**

For projects subject to hydromodification requirements, the applicant will be required to provide additional information. Figures 2-2 and 2-3 are part of the HMP Applicability Determination. Completing these figures will help detail how lower flow thresholds would be determined for a project site. Figures 2-4 and 2-5, which detail the SCCWRP lateral and vertical channel

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susceptibility requirements, complete the HMP Decision Matrix. The additional figures and backup information shall be provided in the SWMP subject to city review.

Prior to completing these figures, the applicant must first determine whether field investigations will be conducted pursuant to the SCCWRP channel screening tools. If the screening tools are not completed for a proposed project, then the site must mitigate peak flows and durations based on a pre-project condition lower flow threshold of 0.1Q2. While a project applicant would be held to the 0.1Q2 standard if channel screening tools and assessments are not conducted, less restrictive standards are possible for more erosion-resistant receiving channel sections if the screening tools are completed and the SCCWRP method results in either a Medium or Low susceptibility to channel erosion.

In such a scenario, the project applicant would also use the critical shear stress calculator to assist in determination of the predicted lower flow threshold. The SCCWRP screening tools and critical shear stress calculator work in concert to determine the lower flow threshold for a given site. Lower flow limits determined by the calculator have been grouped into one of three thresholds – 0.1Q2, 0.3Q2 or 0.5Q2. “Low” susceptibilities from the SCCWRP tool generally correspond to the 0.5Q2 threshold, “Medium” susceptibilities generally correspond to the 0.3Q2 threshold, and “High” susceptibilities generally correspond to the 0.1Q2 threshold. The SCCWRP channel screening tools are required to identify channel conditions not considered by the critical shear stress calculator, which focuses on channel material and cross section. Conversely, the SCCWRP channel screening tools considers other channel conditions including channel braiding, mass wasting, and proximity to the erosion threshold. In cases where the critical shear stress calculator and the SCCWRP screening tools return divergent values, then the most conservative value shall be used as the lower flow threshold for the analysis.

Integrated Management Practices and extended detention facilities are required to meet peak flow and duration controls as follows:

1. For flow rates ranging from 10 percent, 30 percent or 50 percent of the pre-project 2-year runoff event (0.1Q2, 0.3Q2, or 0.5Q2) to the pre-project 10-year runoff event (Q10), the post-project discharge rates and durations shall not deviate above the pre-project rates and durations by more than 10 percent over and more than 10 percent of the length of the flow duration curve. The specific lower flow threshold will depend on results from the SCCWRP channel screening study and the critical flow calculator.
2. For flow rates ranging from the lower flow threshold to Q5, the post-project peak flows shall not exceed pre-project peak flows. For flow rates from Q5 to Q10, post-project peak flows may exceed pre-project flows by up to 10 percent for a 1-year frequency interval. For example, post-project flows could exceed pre-project flows by up to 10 percent for the interval from Q9 to Q10 or from Q5.5 to Q6.5, but not from Q8 to Q10.

This HMP recommends the use of IMP facilities to satisfy both treatment control (numeric) requirements as well as hydromodification criteria. Refer to Section 4.

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The following methods may be used to meet HMP mitigation requirements:

- Install BMPs that meet design requirements to control runoff from new impervious areas. BMPs including bioretention basins, vegetated swales, planter boxes, extended detention basins, etc. shall be designed pursuant to standard sizing and specification criteria detailed in this SUSMP and the HMP/LID Sizing Calculator to ensure compliance with hydromodification criteria.
- Use of the automated sizing calculator (San Diego Sizing Calculator) that will allow project applicants to select and size IMP treatment devices or flow control basins. The tool, akin to the sizing calculator developed for compliance with the Contra Costa HMP, uses pre-calculated sizing factors to determine required footprint sizes for flow control BMPs. Continuous simulation hydrologic analyses have been developed to determine the sizing factors for various flow control options and development scenarios. The Sizing Calculator also includes an automated pond sizing tool to assist in the design of extended detention facilities for mitigation of hydromodification effects. Because of the Sizing Calculator's ease of implementation, and since hydromodification BMPs can also serve as treatment control BMPs, it is anticipated that most project applicants will choose this option instead of seeking compliance through site-specific continuous simulation model preparation.
- Prepare continuous simulation hydrologic models and compare the pre-project and mitigated post-project runoff peaks and durations (with hydromodification flow controls) until compliance to flow control standards can be demonstrated. The project applicant will be required to quantify the long-term pre- and post-project runoff response from the site and establish runoff routing and stage-storage-discharge relationships for the planned flow control devices. Public domain software such as HSPF, HEC-HMS and SWMM can be used for preparation of a continuous simulation hydrologic analysis.

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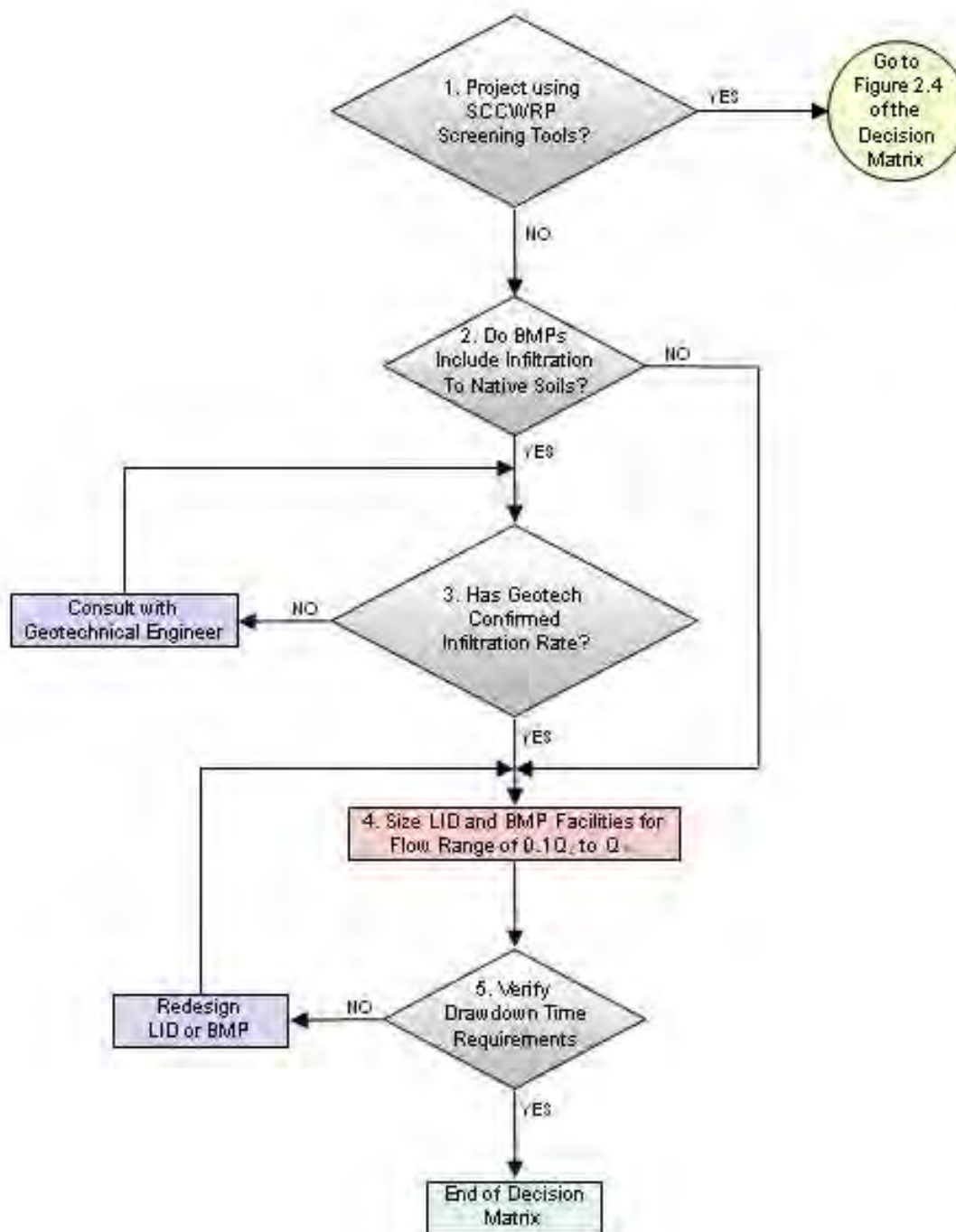


FIGURE 2-2. Mitigation Criteria and Implementation I

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The narrative that explains figure 2-2 is as follows:

- Figure 2-2, Node 1 – If the project applicant chooses to complete SCCWRP channel screening tools, then the applicant moves to Figures 2-4 and 2-5 to assess the vertical and lateral susceptibility of the receiving channel systems. Depending on the results of the SCCWRP screening tools and critical flow calculator, it is possible that lower flow thresholds in excess of 0.1Q₂ may be used. If the project applicant chooses not to complete the SCCWRP channel assessment, then the applicant proceeds with Figure 2-2 of the Decision Matrix.
- Figure 2-2, Node 2 – If the project's IMP or BMP approach accounts for the infiltration of runoff to native surrounding soils (below amended soil layers), then consultation with a geotechnical engineer is required (Box 3). If the project mitigation approach does not account for infiltration of runoff, then the applicant would proceed to Box 4.
- Figure 2-2, Node 3 – A geotechnical engineer should determine the allowable infiltration rates to be used for the design of each IMP or BMP facility. The geotechnical assessment should also identify potential portions of the project which are feasible for infiltration of runoff.
- Figure 2-2, Node 4 – In this scenario, the SCCWRP channel assessment was not conducted. Therefore, the project applicant would be held to the 0.1Q₂ lower flow threshold. IMP and extended detention facilities must be sized so that the mitigated post project flows and durations do not exceed pre-project flows and durations for the geomorphically-significant flow range of 0.1Q₂ to Q₁₀.
- Figure 2-2, Node 5 - The Decision Matrix includes language regarding a drawdown time requirements so that standards set forth by the County's Department of Environmental Health are met. As a side note, the County's Department of Environmental Health has stated that the drawdown requirement would be applied to underground vaults in addition to extended detention basins and the surface ponding areas of IMP facilities. Proper maintenance of hydromodification mitigation facilities is essential to guard against potential vector issues as well potential safety issues resulting from long-term standing water. If mitigation facility outlets clog, then runoff will bypass the system and potentially result in additional erosion problems downstream of a site.

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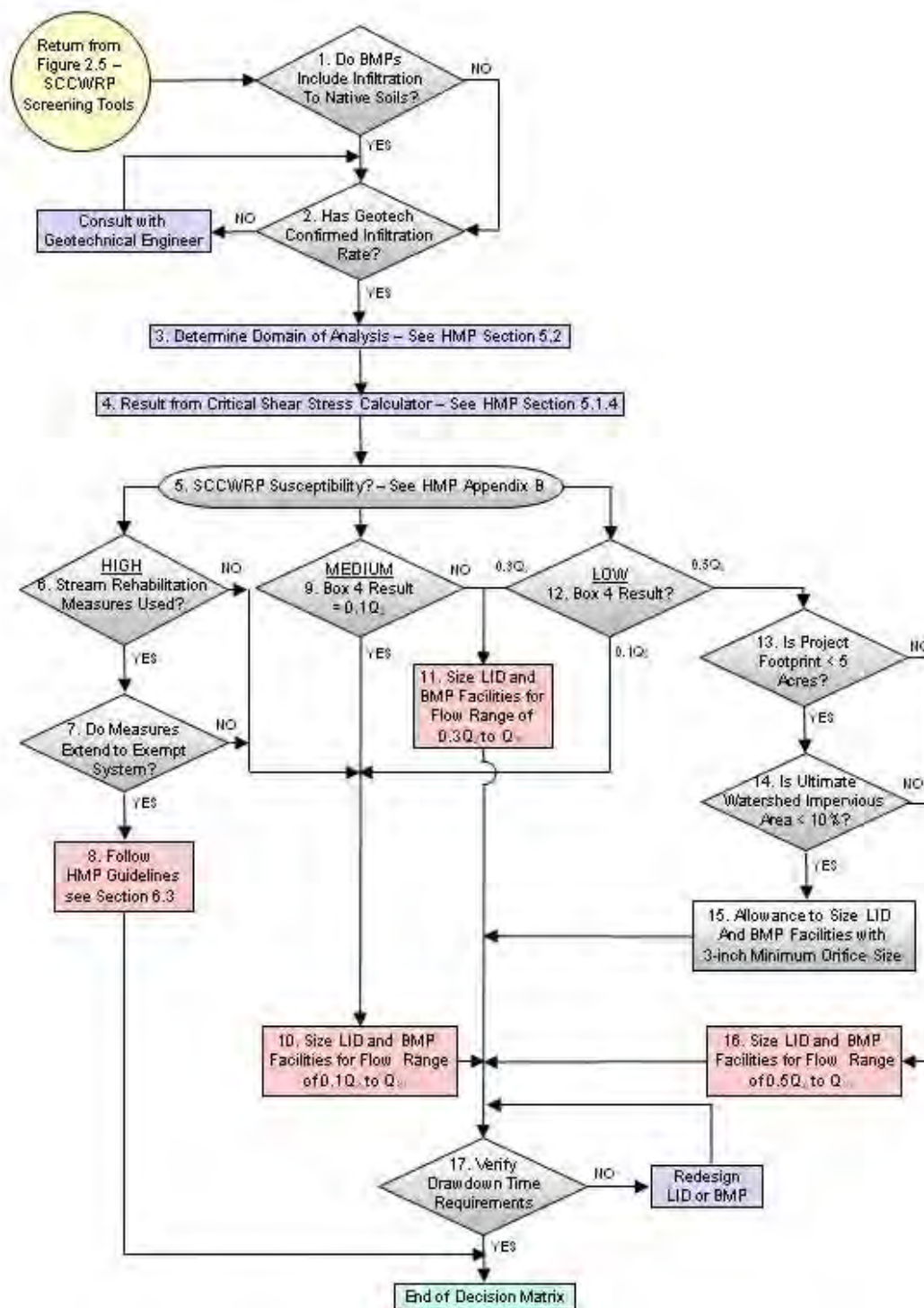


FIGURE 2-3. Mitigation Criteria and Implementation II

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The narrative that explains figure 2-3 is as follows:

- Figure 2-3, Node 1 – Use of Figure 2-3 assumes that the project applicant conducted the SCCWRP channel assessment. Box 1 would begin following completion of both the lateral and vertical susceptibility flow charts depicted in Figures 2-4 and 2-5. Box 1 is a decision box asking if the project's IMP or BMP approach accounts for the infiltration of runoff to native surrounding soils (below amended soil layers). If the answer is Yes, then consultation with a geotechnical engineer is required (Box 2). If the project mitigation approach does not account for infiltration of runoff, then the applicant would proceed to Box 3.
- Figure 2-3, Node 2 – A geotechnical engineer should determine the allowable infiltration rates to be used for the design of each IMP or BMP facility. The geotechnical assessment should also identify potential portions of the project which are feasible for infiltration of runoff.
- Figure 2-3, Node 3 – Pursuant to criteria detailed in HMP Section 5.2, the Domain of Analysis is determined downstream and upstream of the project site. This determination is used to ascertain the required reach length for data collection (channel bed and bank material, channel cross section data, etc.) required for the critical flow calculator (see Box 4),
- Figure 2-3, Node 4 – Pursuant to criteria detailed in HMP Section 5.1.4, the project applicant would run the critical shear stress calculator to determine if the recommended critical flow threshold should be $0.1Q_2$, $0.3Q_2$, or $0.5Q_2$. This result will be compared to the result from the SCCWRP screening analysis (Box 5) to determine the final lower flow threshold for the project.
- Figure 2-3, Node 5 – Pursuant to criteria detailed in HMP Appendix B, the project applicant would determine both the lateral and vertical channel susceptibility rating per guidelines set forth by SCCWRP. If the lateral and vertical tools returned divergent results, then the more conservative result would be used. SCCWRP susceptibility ratings include “High”, “Medium”, and “Low”.
- Figure 2-3, Node 6 – A project applicant would arrive at Box 6 if the SCCWRP channel susceptibility rating was determined to be “High”. This decision box inquires as to whether stream rehabilitation measures such as grade control and channel widening will be used as a mitigation measure instead of flow control. It should be noted that stream rehabilitation options are only allowed if the existing receiving channel susceptibility is considered to be “High”.
- Figure 2-3, Node 7 – Stream rehabilitation measures are only allowed if the proposed mitigation project extends to a downstream exempt system (such as an exempt river

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system). If the mitigation measure did not extend to an exempt system, then the potential for cumulative watershed impacts would be more pronounced.

- Figure 2-3, Node 8 – If stream rehabilitation measures are allowed, then guidelines outlined in Section 6.3 of the HMP should be followed to design the in-stream mitigation approach.
- Figure 2-3, Node 9 - A project applicant would arrive at Box 9 if the SCCWRP channel susceptibility rating was determined to be “Medium”. If the result from the critical shear stress calculator is also “Medium” (or $0.3Q_2$), then the lower flow threshold would be $0.3Q_2$ (Box 11). If the result from the critical shear stress calculator is “High” (or $0.1Q_2$), then the more conservative value would be used and the lower flow threshold would be $0.1Q_2$ (Box 10).
- Figure 2-3, Node 10 – For stream reaches determined by either the critical flow calculator or the SCCWRP screening tools to have a “High” susceptibility to erosion, IMP and extended detention flow control facilities should be sized so that the mitigated post project flows and durations do not exceed pre-project flows and durations for the geomorphically-significant flow range of $0.1Q_2$ to Q_{10} .
- Figure 2-3, Node 11 - For stream reaches determined by either the critical flow calculator or the SCCWRP screening tools to have a “Medium” susceptibility to erosion, LID and extended detention flow control facilities should be sized so that the mitigated post project flows and durations do not exceed pre-project flows and durations for the geomorphically-significant flow range of $0.3Q_2$ to Q_{10} .
- Figure 2-3, Node 12 - A project applicant would arrive at Box 12 if the SCCWRP channel susceptibility rating was determined to be “Low”. If the result from the critical shear stress calculator is also “Low” (or $0.5Q_2$), then the lower flow threshold would be $0.5Q_2$ (Box 16 – note potential waiver in Box 13). If the result from the critical shear stress calculator is “High” (or $0.1Q_2$), then the more conservative value would be used and the lower flow threshold would be $0.1Q_2$ (Box 10). If the result from the critical flow calculator is “Medium” (or $0.3Q_2$), then the more conservative value would be used and the lower flow threshold would be $0.3Q_2$ (Box 11).
- Figure 2-3, Node 13 – In some limited situations, namely small developments in rural or lightly developed areas, an allowance for a minimum outlet orifice size may be granted when the receiving channel susceptibility is “Low”. Alternate outlet orifice criteria may potentially be used for project footprints less than 5 acres. If the project footprint is greater than 5 acres, then the allowance may not be granted and the applicant would proceed to Box 16.
- Figure 2-3, Node 14 – The potential allowance discussed in Box 13 could only be granted if the ultimate potential impervious area in the sub-watershed is less than 10

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percent. If there is potential for the sub-watershed impervious area to exceed 10 percent, then the minimum orifice size criteria may not be granted.

- Figure 2-3, Node 15 – If Boxes 12, 13, and 14 are satisfied, then mitigation facilities may be designed using a 3-inch minimum outlet orifice size.
- Figure 2-3, Node 16 - For stream reaches determined by either the critical flow calculator or the SCCWRP screening tools to have a “Low” susceptibility to erosion – and for projects where the minimum outlet orifice criteria does not apply - IMP and extended detention flow control facilities should be sized so that the mitigated post project flows and durations do not exceed pre-project flows and durations for the geomorphically-significant flow range of 0.5Q₂ to Q₁₀.
- Figure 2-3, Node 17 – For all hydromodification mitigation designs, the Decision Matrix includes language regarding drawdown time requirements so that standards set forth by the County’s Department of Environmental Health are met. As a side note, the County’s Department of Environmental Health has stated that the drawdown requirement would be applied to underground vaults in addition to extended detention basins and the surface ponding areas of IMP facilities. Proper maintenance of hydromodification mitigation facilities is essential to guard against potential vector issues as well potential safety issues resulting from long-term standing water. If mitigation facility outlets clog, then runoff will bypass the system and potentially result in additional erosion problems downstream of a site.

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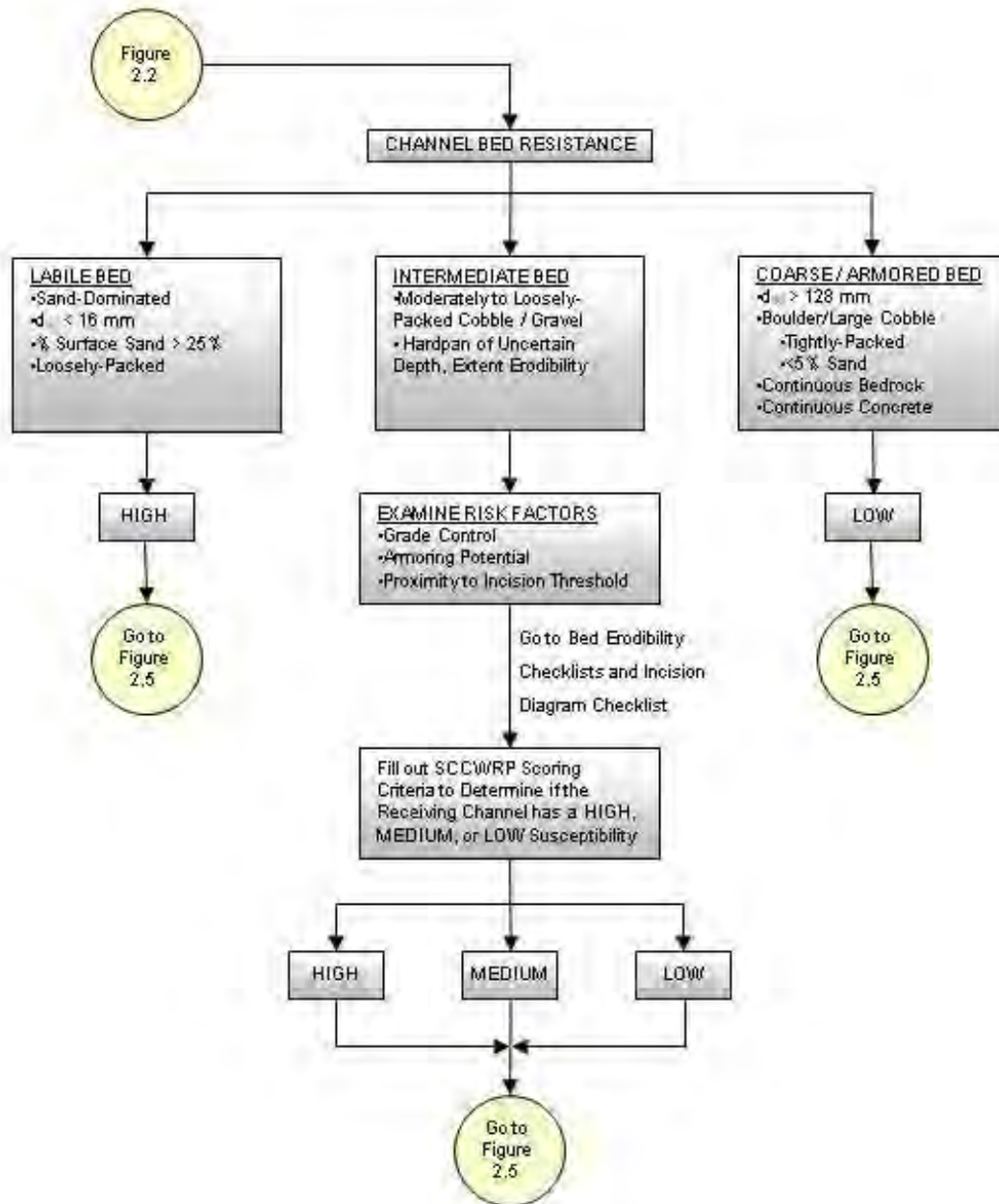


FIGURE 2-4. SCCWRP Vertical Susceptibility Matrix

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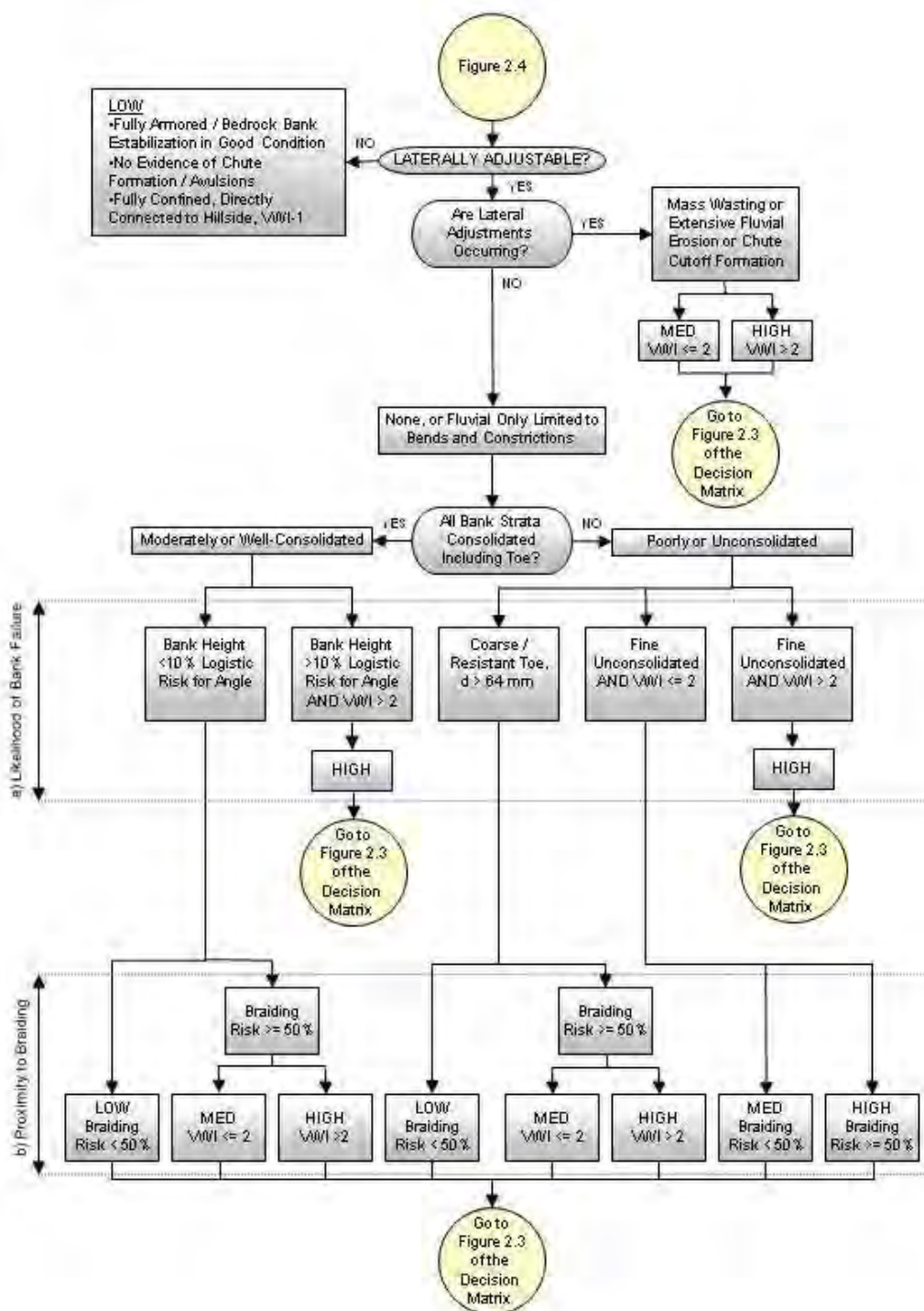


FIGURE 2-5. Lateral Channel Susceptibility Matrix

Criteria for Infiltration Devices

The Municipal Permit restricts the design and location of “infiltration devices” that, as designed, may bypass filtration through surface soils before reaching groundwater. These devices include:

- Infiltration basins.
- Infiltration trenches (includes French drains).
- Unlined retention basins (i.e., basins with no outlets).
- Unlined or open-bottomed vaults or boxes installed below grade (dry wells).

Infiltration devices may not be used in:

- Areas of industrial or light industrial activity; areas subject to high vehicular traffic (25,000 or greater average daily traffic on main roadway or 15,000 or more average daily traffic on any intersecting roadway);
- Automotive repair shops;
- Car washes;
- Fleet storage areas (bus, truck, etc.);
- Nurseries;
- Other areas with pollutant sources that could pose a threat to groundwater, as designated by the city.

The vertical distance from the base of any infiltration device to the seasonal high groundwater mark shall be at least 10 feet. Infiltration devices shall be located a minimum of 100 feet horizontally from any known water supply wells.

In addition, infiltration devices are not recommended where:

- The infiltration device would receive drainage from areas where chemicals are used or stored, where vehicles or equipment are washed, or where refuse or wastes are handled.
- Surface soils or groundwater are polluted.
- The facility could receive sediment-laden runoff from disturbed areas or unstable slopes.
- Increased soil moisture could affect the stability of slopes of foundations.
- Soils are insufficiently permeable to allow the device to drain within 72 hours.

► MOST LID FEATURES AND FACILITIES ARE NOT INFILTRATION DEVICES

Bioretention facilities work by percolating runoff through 18 inches or more of engineered soil. This removes most pollutants before the runoff is allowed to seep into native soils below. Further pollutant removal typically occurs in the unsaturated (vadose) zone before moisture reaches groundwater. Based on these design elements, self-treating and self-retaining areas, bioretention facilities, and planter boxes are not considered to be infiltration devices.

SECTION 2: IDENTIFY POLLUTANTS, BMP SIZING AND SELECTION

Where there is concern about the effects of increased soil moisture on slopes or foundations, an impermeable barrier may be added so the facility is “flow through” and all treated runoff is underdrained away from the facility. See the design sheets for Bioretention Facilities and Flow-Through Planters in Section 4.

References and Resources:

- [RWQCB Order R9-2007-0001 \(Municipal Permit\)](#)
- [County of San Diego Low Impact Development Handbook](#)
- [Clean Water Act Section 402\(p\)](#)
- [40 CFR 122.26](#)
- [San Diego Regional Water Quality Control Board—TMDLs](#)
- [State Water Resources Control Board—Ocean Standards](#)
- [Site Planning for Urban Stream Protection](#) (Scheuler, 1995).
- [“Application of Water-Quality Engineering Fundamentals to the Assessment of Stormwater Treatment Devices”](#) (Salvia, 2000).

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Preparing Your Storm Water Management Plan

Step-by-step assistance to demonstrate compliance.

If you have determined your project qualifies as a Priority Development Project (PDP), it is time to collect information and prepare a **Storm Water Management Plan** (SWMP) that addresses how your project satisfies the Standard Stormwater Requirements and the additional storm water criteria. The earlier you know this, the earlier you can incorporate the additional storm water criteria into your project. To facilitate your project review process, please find a Qualified SWMP Preparer to prepare the SWMP for your project.

This Section provides guidance on how to prepare a SWMP. Once completed, a SWMP will demonstrate how your project complies with all applicable requirements in the stormwater Municipal Permit—to minimize imperviousness, retain or detain stormwater, slow runoff rates, incorporate required source controls, treat stormwater prior to discharge, control runoff rates and durations, and provide for operation and maintenance of treatment and flow-control facilities.

A SWMP is an important document that, like other reports, includes findings and recommendations that must be incorporated into the discretionary and final design documents you submit to the city. From the initial design you should ensure that your project is developed in concert with your Storm Water Management Plan. Performing early design efforts will save time and avoid potential delays later in the review process.

► PRELIMINARY SWMP'S AND SWMP'S

If your project requires discretionary permits and your project is a PDP, you will be required to prepare and submit a *preliminary* SWMP that demonstrates feasibility to satisfy the SUSMP requirements. This is similar to how you would prepare preliminary hydrology studies for a project. In general the basic content of the *preliminary* SWMP contains much of that found in a *final* SWMP. The design of any project will be affected by the results of the treatment control BMP sizing and flow-control facilities. If you have questions on content and/or format, please contact city staff to discuss further.

If your project is a PDP, SWMP's are documents that are submitted concurrently with construction documents (e.g.: final maps, grading plans, improvement plans, landscape plans, building plans, etc.). SWMP's, once approved for a project, are a living document that address how the SUSMP criteria is met.

► USE SUBMITTAL CHECKLISTS

Typically, a SWMP must be coordinated with your application for discretionary and/or plancheck review. Your SWMP must have sufficient detail and should match the other documents being processed or submitted (e.g.: site plan, grading plans, improvement plans and landscaping plan). If there are discrepancies, the city will return comments to resolve them prior to resubmittal.

A complete and thorough SWMP will facilitate quicker review and fewer cycles of review. Prior to submittal, please use the SWMP Requirements Checklist to help ensure your SWMP has the correct content. You'll find current checklists available on the city website at www.carlsbadca.gov/development-forms.

Step by Step

Suggested coordination with site and landscape design

Plan and design your stormwater controls integrally with the site planning and landscaping for your project. It's best to start with general project requirements and preliminary site design concepts, then prepare the detailed site design, landscape design, and stormwater control design simultaneously. **This will help ensure that your site plan, grading plan, improvement plan, landscape plan, and Storm Water Management Plan are all congruent.**

Begin with general project requirements and program.

The following step-by-step procedure should optimize your design by identifying the best opportunities for stormwater controls **early in the design process.**

The recommended steps are:

Sketch conceptual site layout, building locations, and circulation.

1. Assemble needed information.
2. Identify site opportunities and constraints.
3. Specify source controls using the sources/source control checklist in the Appendix 1.
4. Review Section 2 to identify the anticipated pollutants and BMP sizing requirements that apply to your project.

5. Follow the LID design guidance in Section 4 to analyze your project for LID and to develop and document your drainage design.

Revise site layout, building locations, and circulation to accommodate LID design. Develop landscaping plan.

Submit Site Plan, Landscape Plan, Grading Plan, Improvement Plan and SUSMP Submittal

6. Prepare a single-sheet post-construction BMP Exhibit.
7. Plan for ongoing maintenance of treatment and flow-control facilities.
8. Complete the Storm Water Management Plan.

For complex projects or highly constrained areas, we recommend you prepare and submit a preliminary review of your site design prior to formally applying for land use approvals. Your preliminary site design should incorporate a conceptual plan for site drainage, including self-treating and self-retaining areas and the location and approximate sizes of any treatment control, flow-control or IMP facilities. This additional up-front design effort will save time and avoid potential delays later in the review process.

Step 1: Assemble Needed Information

To select types and locations of treatment facilities, the designer needs to know the following site characteristics:

- **Existing natural hydrologic features** and natural resources, including any contiguous natural areas, wetlands, watercourses, seeps, or springs.
- **Existing site topography**, including contours of any slopes of 4% or steeper, general direction of surface drainage, local high or low points or depressions, any outcrops or other significant geologic features.
- **Zoning**, including requirements for **setbacks** and **open space**.
- **Engineering Standards** governing minimum street widths, sidewalk construction, allowable pavement types, and drainage. Soil types (including **hydrologic soil groups**) and depth to groundwater, which may determine whether infiltration is a feasible option for managing site runoff. Depending on site location and characteristics, and on the selection of treatment and flow-control facilities, site-specific information (e.g. from boring logs or geotechnical studies) may be required.
- **Existing site drainage.** For undeveloped sites, this should be obtained by inspecting the site and examining topographic maps and survey data. For previously developed sites, site drainage and connection to the municipal storm drain system can be located from site inspection, and record drawing research.
- Existing **vegetative cover** and **impervious areas**, if any.

References and Resources

- [*Site Planning for Urban Stream Protection*](#) (Scheuler 1995).
- [*Start at the Source*](#) (BASMAA 1999), p. 36

Step 2: Identify Constraints & Opportunities

Review the information collected in Step 1. Identify the principal constraints on site design and selection of treatment and flow-control facilities as well as opportunities to reduce imperviousness and incorporate facilities into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, restricted right-of-way, or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including landscape buffers (which can double as locations for bioretention facilities), and differences in elevation (which can provide hydraulic head). Note: stormwater treatment facilities should not be located within protected riparian or habitat areas.

Prepare a brief **narrative** describing site opportunities and constraints. This narrative will help you as you proceed with LID design and explain your design decisions to city staff.

Step 3. Specify Source Control BMPs

Some everyday activities – such as trash recycling/disposal and washing vehicles and equipment – generate pollutants that tend to find their way into storm drains. These pollutants can be minimized by applying **source control BMPs**.

Source control BMPs include **permanent**, structural features that must be incorporated into your project plans and **operational** BMPs, such as regular sweeping and “housekeeping,” that must be implemented by the site’s occupant, resident or user. The maximum extent practicable standard typically requires both types of BMPs. In general, operational BMPs cannot be substituted for a feasible and effective permanent BMP.

Use the following procedure to specify source control BMPs for your site:

► IDENTIFY POLLUTANT SOURCES

Review the first column in the **Pollutant Sources/Source Control Checklist** (Appendix 1). Check off the potential sources of pollutants that apply to your site.

► NOTE LOCATIONS ON SUBMITTAL DRAWING

Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist (Appendix 1). Show the location of each pollutant source and each permanent source control BMP in your submittal drawing.

► PREPARE A TABLE AND NARRATIVE

Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist (Appendix). Now, create a table using the format in Table 3-1. In the left column, list each potential source on your site (from Appendix, Column 1). In the middle

SECTION 3: PREPARING YOUR STORMWATER MANAGEMENT PLAN

column, list the corresponding **permanent, structural BMPs** (from Columns 2 and 3, Appendix) used to prevent pollutants from entering runoff. In your SWMP, accompany this table with a narrative that explains any special features, materials, or methods of construction that will be used to implement these permanent, structural BMPs. Identify Operational Source Control BMPs.

TABLE 3-1. Format for table of permanent and operational source control measures.

<i>Potential source of runoff pollutants</i>	<i>Permanent source control BMPs</i>	<i>Operational source control BMPs</i>

To complete your table, refer once again to the Pollutant Sources/Source Control Checklist (Appendix, 1 Column 4). List in the right column of your table the operational BMPs that should be implemented as long as the anticipated activities continue at the site. The same BMPs may also be required as a conditional use permit for use of the site.

References and Resources

- Appendix: Stormwater Pollutant Sources/Source Control Checklist
- RWQCB Order R9-2007-0001, Provision D.1.d.(5)
- [Start at the Source](#), Section 6.7: Details, Outdoor Work Areas
- [California Stormwater Industrial/Commercial Best Management Practice Handbook](#)
- *Urban Runoff Quality Management* (WEF/ASCE, 1998) Section 4: Source Controls

Step 4: Identify anticipated pollutants and BMP sizing requirements

Review Section 2 to determine what types of pollutants are anticipated with your project type. Identify any impaired water bodies the project drains to and which pollutants this project should reduce to ensure the impairments are not exceeded.

Review Figures 2-1 through 2-5 to find out if your project is subject to flow-control (hydromodification) and what flow limits your flow-control facilities should be designed to. If your PDP is subject to hydromodification you might choose to use the unified LID design guide in Section 4 to select and size your Integrated Management Practice facilities.

If your project is not subject to hydromodification, review the treatment control (numerical) requirements that apply to your projects storm water design.

Step 5: Prepare and Document Your LID Design

Use the Low Impact Development Design Guide (Section 4) to analyze your project for LID, design and document drainage, and specify preliminary design details for integrated management

SECTION 3: PREPARING YOUR STORMWATER MANAGEMENT PLAN

practices. **Follow the detailed instructions in Section 4 to ensure your project complies with Municipal Permit LID requirements (Provision D.1.d.(4)) and stormwater treatment requirements in Provision D.1.d.(6)).** The LID Design Guide has been designed so that hydromodification management requirements are also met via this unified design procedure. Section 4 includes calculation procedures and formats for presenting your calculations.

As shown in the SWMP requirements checklist, your SWMP shall include a DMA exhibit showing:

- The entire site divided into separate drainage management areas (DMAs), with each area identified as one of the following: self-treating, self-retaining, draining to a self-retaining area, or draining to an IMP. Each area should be clearly marked with a unique identifier.
- For each drainage area, the types of impervious area proposed, and the area of each.
- Proposed locations and sizes of treatment facilities. Each facility should be clearly marked with a unique identifier.

Compliance

The design criteria for DMAs in Chapter 4 ensure the required volume of flow from all developed portions of the project, including landscaped areas, is infiltrated, filtered, or treated (Provision D.1.d.(6)(a)).

Depending on your storm water treatment approach your SWMP may need to include:

- Tabulation of proposed self-treating areas, self-retaining areas, areas draining to self-retaining areas, and areas draining to TCBMP/IMPs, and the corresponding TCBMP/IMPs identified on the Exhibit.
- Calculations, in the format shown in Section 4, showing the minimum square footage required and proposed square footage for each IMP or sizing results for each TCBMP using the alternative to LID approach. Provide sizing calculations for flow-control facilities, if any.
- Preliminary designs for each TCBMP, IMP, or flow control facility. The design sheets and accompanying drawings in Section 4 (or CASQA) may be used or adapted for this purpose.

The following may also be required, or may be advisable to assist the reviewer to understand your design:

- A narrative overview of your design and how your design decisions optimize the site layout, use pervious surfaces, disperse runoff from impervious surfaces, and drain impervious surfaces to engineered IMPs. See Section 4.
- A narrative briefly describing each **drainage management area** (DMA), its drainage, and where drainage will be directed.
- A narrative briefly describing each IMP. Include any special characteristics or features distinct from the design sheets in Section 4.

References and Resources

- [Section 4](#)
- [County of San Diego Low Impact Development Handbook](#)
- [Carlsbad General Plan](#)
- Carlsbad Zoning Ordinance and Development Codes
- [Low Impact Development Manual](#) (Prince George's County, Maryland, 1999).
- [Bioretention Manual](#) (Prince George's County, Maryland, rev. 2002)
- [Site Planning for Urban Stream Protection](#) (Schueler, 1995b).
- [Low Impact Development Technical Guidance Manual for Puget Sound](#) (Puget Sound Action Team, 2005)
- [LID for Big Box Retailers](#) (Low Impact Development Center, 2006)

Step 6: Single Sheet Post-construction BMP Exhibit

The city understands that different construction plans may play a part in constructing the different LID, site design, treatment control and flow control (hydromodification) BMP's identified in a SWMP. To help summarize how all the construction plans play their part the single-sheet post construction BMP Exhibit will assist the applicant, reviewer, contractor and inspector on where all the post construction BMP's are located on a project site and which construction plans is responsible to install them. For guidelines on preparing a single-sheet post construction BMP (SSBMP) Exhibit requirements, refer to the SWMP checklist on the city's website at www.carlsbadca.gov/development-forms and view a sample SSBMP exhibit at www.carlsbadca.gov/standards. Under each web destination, click on the 'engineering' tab to find what you are looking for.

Step 7: Stormwater Facility Maintenance

Pursuant to Provision D.1.c.(5) of the Municipal Permit, the city requires submittal of proof of a mechanism under which ongoing long-term maintenance of stormwater treatment and flow-control facilities will be conducted. To address this requirement, the city requires the property owner execute a city standard Permanent Stormwater Quality BMP Maintenance Agreement (Agreement) that records against the property or lease.

The Agreement serves several purposes. One is to inform the current, prospective or future owners that the subject property includes treatment BMP or flow-control facilities that require inspection, maintenance and/or replacement. The Agreement incorporates the SWMP as it effectively describes how the original project, how treatment BMP's/flow-control facilities were selected/installed for the project and the annual maintenance requirements/estimated costs for each BMP.

The Agreement also identifies the city's ability to notify the property owner when deficiencies are found. In the event of in-action, the Agreement also identifies how abatement procedures may be required. In the event the city finds that treatment BMP or flow-control facilities are not properly maintained and the property owner does not perform, the city will pursue enforcement provisions of Chapter 15.12 of the Carlsbad Municipal Code.

In rare circumstances, BMP's originally installed with the project may be found to be inadequate at removing target pollutants or result in other concerns (e.g. standing water, vector issues, nuisance flows, etc.) When BMP fails, the property owner is responsible take corrective action. This may include removal, replacement or installation of another BMP to remove/filter pollutants from the project.

Details of these requirements, and instructions for preparing a detailed operation and maintenance plan, are in Section 5.

References and Resources

- [Section 5](#)
- Operation, Maintenance, and Management of Stormwater Management Systems (Watershed Management Institute, 1997)

Step 8: Complete Your SWMP

Your SWMP should document the information gathered and decisions made in Steps 1-5. A clear, complete, well-organized SWMP will make it possible to confirm your design meets the minimum requirements of the Municipal Permit, the municipal stormwater pollution prevention ordinance, and this *SUSMP*.

► COORDINATION WITH SITE, ARCHITECTURAL, AND LANDSCAPING PLANS

Before completing your SWMP, ensure your stormwater control design is fully coordinated with the site plan, grading plan, improvement plan and landscaping plan being proposed for the site.

► CERTIFICATION

Your SWMP must be certified by a person having one or more of the following registrations or certifications:

1. A California registered civil engineer,
2. A California registered geologist,
3. A California registered landscape architect,
4. A professional hydrologist registered through the American Institute of Hydrology,
5. A certified professional soil scientist registered through the Soil Science Society of America,
6. A certified professional in erosion and sediment control registered through Certified Professional in Erosion and Sediment Control, Inc.,
7. A certified professional in storm water quality registered through Certified Professional in Erosion and Sediment Control, Inc.,

SECTION 3: PREPARING YOUR STORMWATER MANAGEMENT PLAN

8. A certified professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies.

Any hydrology or hydraulic calculations, soils reports or geotechnical reports prepared in conjunction with a SWMP must be prepared by a professional engineer with the appropriate registration qualifications issued by the State of California.

The SWMP certification should state: “The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.”

SECTION 3: PREPARING YOUR STORMWATER MANAGEMENT PLAN

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Low Impact Development (LID) Design Guide

Guidance for designing and documenting your LID site drainage, stormwater treatment facilities, and flow-control facilities

This Section includes procedures on how to achieve compliance with the stormwater objectives discussed earlier in this chapter including: 1) Low Impact Development (LID) criteria, 2) Stormwater treatment control (numeric), and 3) Flow-control (hydromodification) requirements that may affect your project. Please see the earlier Sections to explore how the objectives apply to your project.

To satisfy the applicable objectives above, there are two main alternatives you must choose between. Depending on your project characteristics, constraints, and opportunities, you may choose to:

- 1) Use the integrated LID strategy (see page 60) to develop and size **Integrated Management Practices** (IMPs), or
- 2) Use the “Alternatives to LID design” (see page 74) which requires you to show how you satisfy each stormwater objective separately.

Depending on the storm water standards that apply to your project and using the correct sizing factors, you may use the integrated LID design to size either treatment control best management practices (TCBMP's) or the comprehensive IMP's. With either approach, you will need to carefully document:

- Pervious and impervious areas in the planned project.
- Drainage from each of these areas.
- Locations, sizes, and types of proposed TCBMP or IMP facilities.

Your SWMP must include calculations showing the site drainage and proposed integrated LID treatment facilities meet the criteria in this *SUSMP*. Refer to the SWMP requirements checklist.

Approach to Integrated LID

Conceptually, there are four LID strategies for managing runoff from buildings and paving:

1. **Optimize the site layout** by preserving natural drainage features and designing buildings and circulation to minimize the amount of roofs and paving.
2. **Use pervious surfaces** such as turf, gravel, or pervious pavement—or use surfaces that retain rainfall, such as vegetated roofs. All drainage from these surfaces is considered to be “self-retained” (a detailed definition corresponding to this concept is on page 65). Address how these areas will convey 100-year storm events and consider overflow conditions.
3. **Disperse runoff** from impervious surfaces on to adjacent pervious surfaces (e.g., direct a roof downspout to disperse runoff onto a lawn).
4. Drain impervious surfaces to engineered TCBMP’s or IMPs, such as bioretention facilities, planter boxes, cisterns, or dry wells. IMPs infiltrate runoff to groundwater and/or percolate runoff through engineered soil and allow it to drain away slowly.

With forethought in design, the four strategies provide multiple, complementary benefits to your development. Pervious surfaces reduce heat island effects and temperature extremes. Landscaping improves air quality, creates a better place to live or work, and upgrades value for rental or sale. Retaining natural hydrology helps preserve and enhance the natural character of the area. LID drainage design can also conserve water and reduce the need for drainage infrastructure.

Applicants may choose not to use this LID strategy above, in which case they will need to demonstrate, in their SWMP, compliance with applicable LID criteria, stormwater treatment criteria, and (if subject to hydromodification requirements) flow-control criteria. See “Alternatives to LID Design” at the end of this Section for more information

Table 4-1 includes ideas for applying LID strategies to site conditions and types of development.

SECTION 4: LID DESIGN GUIDE

TABLE 4-1. Ideas for Runoff Management

<i>Site Features and Design Objectives</i>	<i>Self-retaining Areas</i>	<i>Pervious Pavement</i>	<i>Bioretention Facility</i>	<i>Flow-through Planter</i>	<i>Dry Well</i>	<i>Cistern with bioretention</i>	<i>Vegetated Roof</i>
Clayey native soils			✓	✓		✓	✓
Permeable native soils		✓	✓	✓	✓		✓
Very steep slopes				✓			✓
Shallow groundwater				✓			✓
Avoid saturating subsurface soils				✓			✓
Connect to roof downspouts	✓		✓	✓	✓	✓	
Parking lots/islands and medians		✓	✓		✓		
Sites with extensive landscaping	✓	✓	✓				
Densely developed sites with limited space/landscape		✓		✓	✓	✓	✓
Fit TCBMP/IMPs into landscape and setback areas			✓			✓	
Make drainage a design feature	✓		✓			✓	
Convey as well as treat stormwater			✓	✓			

► OPTIMIZE THE SITE LAYOUT

To minimize stormwater-related impacts, apply the following design principles to the layout of newly developed and redeveloped sites.

Conserve natural areas, soils, and vegetation. Define the development envelope and protected areas, identifying areas that are most suitable for development and areas that should be left undisturbed. Use the following guideline to determine the least sensitive areas of the site, in order of increasing sensitivity:

1. Areas devoid of vegetation, including previously graded areas and agricultural fields.
2. Areas of non-native vegetation, disturbed habitats and eucalyptus woodlands where receiving waters are not present.
3. Areas of chamise or mixed chaparral, and non-native grasslands.
4. Areas containing coastal scrub communities.
5. All other upland communities.
6. Occupied habitat of sensitive species and all wetlands (as both are defined by the local jurisdiction).

Within each of the previous categories, hillside areas should be considered more sensitive than flatter areas.

Coordination

Chapter 1 includes a presentation of how review of your project's site design and landscape design is coordinated with review for compliance with stormwater NPDES requirements.

Where possible, conform the site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, and replicate the site's natural drainage patterns. Set back development from creeks, wetlands, and riparian habitats. Preserve significant trees, especially native trees and shrubs, and identify locations for planting additional native or drought tolerant trees and large shrubs. Concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration.

For all types of development, **limit overall coverage** of paving and roofs. Where allowed by zoning fire code, and other design standards—and provided public safety and a walkable environment are not compromised—this can be accomplished by designing compact, taller structures, narrower and shorter streets and sidewalks, smaller parking lots (fewer stalls, smaller stalls, and more efficient lanes), and indoor or underground parking. Examine site layout and circulation patterns and identify areas where landscaping can be substituted for pavement.

Detain and retain runoff throughout the site. On flatter sites, it typically works best to intersperse landscaped areas and TCBMP/IMPs among the buildings and paving. On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and TCBMP/IMPs in lower areas.

Use drainage as a design element. Use depressed landscape areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design. Bioretention areas can be almost any shape and should be located at low points. Bioretention areas shaped as swales can detain and treat low runoff flows and also convey higher flows.

► USE PERVIOUS SURFACES

Consider a vegetated roof. Although not yet widely used in California, vegetated or “green” roofs are growing in popularity. Potential benefits include longer roof life, lower heating and cooling costs, and better sound insulation, in addition to air quality and water quality benefits. For SUSMP compliance purposes, vegetated roofs are considered not to produce increased runoff or runoff pollutants (i.e., any runoff from a vegetated roof requires no further treatment or detention). For more information on vegetated roofs, see www.greenroofs.org.

Consider permeable pavements and surface treatments. Inventory paved areas on your preliminary site plan. Identify where permeable pavements, such as crushed aggregate, turf block, unit pavers, pervious concrete, or pervious asphalt could be substituted for impervious concrete or asphalt paving.

► DISPERSE RUNOFF TO ADJACENT PERVIOUS AREAS

Look for opportunities to direct runoff from impervious areas to adjacent pervious landscaping. The design must include sufficient calculations, drainage, and soil infiltration rates to demonstrate that 1-inch of rainfall over the study area will soak into the soil and produce no runoff. The study area includes both the impervious area and the pervious landscape area. For example, a lawn or garden can be depressed below surrounding walkways or driveways provide a simple but functional landscape design element.

Under some circumstances, it may be allowable to direct runoff from impervious areas to pervious pavement (for example, from roof downspouts to a parking lot paved with crushed aggregate or turf block). The pore volume of pavement and base course must be sufficient to retain an inch of rainfall, including runoff from the tributary area. The slopes and soils must be compatible with infiltrating that volume without producing runoff from 1 inch of rainfall.

► DIRECT RUNOFF TO INTEGRATED MANAGEMENT PRACTICES

Project Clean Water has developed design criteria for the following TCBMP/IMPs:

- **Bioretention facilities**, which can be configured as swales, free-form areas, or planters to integrate with your landscape design.
- **Flow-through planters**, which can be used near building foundations and other locations where infiltration to native soils is not desired.
- **Dry wells** and other infiltration facilities, which can be used only where soils are permeable.
- **Cisterns or vaults**, in combination with a bioretention facility.

See the design sheets at the end of this Section.

Finding the right location for treatment facilities on your site involves a careful and creative integration of several factors:

- To make the most efficient use of the site and to maximize aesthetic value, **integrate TCBMP/IMPs with site landscaping**. The zoning code may require landscape setbacks or buffers, or may specify that a minimum portion of the site be landscaped. It may be possible to locate some or all of your site's treatment and flow-control facilities within this same area, or within utility easements (subject to easement holder approval) or other non-buildable areas.
- Planter boxes and bioretention areas must be **level or nearly level** all the way around. Bioretention areas configured as swales may be gently sloped in the linear direction, but opposite sides must be at the same elevation.
- For effective, low-maintenance operation, **locate facilities so drainage into and out of the device is by gravity flow**. Pumped systems are feasible, but are expensive, require more maintenance, are prone to untimely failure, and can cause mosquito control problems. Most TCBMP/IMPs require 3 feet or more of head.
- The facility must be accessible to equipment needed for its maintenance. **Access requirements for maintenance** will vary with the type of facility selected. Planter boxes and bioretention areas will typically need access for the same types of equipment used for landscape maintenance.

To complete your analysis, include in your SWMP a brief **narrative** documenting the site layout and site design decisions you made. This will provide background and context for how your design meets the quantitative LID design criteria.

Integrated LID Design

The **design documentation procedure** begins with careful delineation of pervious areas and impervious areas (including roofs) throughout the site. The procedure accounts for how runoff from each delineated area is managed. For areas draining to TCBMP/IMPs, the procedure ensures each TCBMP/IMP is appropriately sized.

The procedure results in a space-efficient, cost-efficient integrated LID design for meeting SUSMP requirements on most residential and commercial/industrial developments. The procedure arranges documentation of drainage design and TCBMP/IMP sizing in a consistent format for presentation and review.

This procedure is intended to facilitate, not substitute for, creative interplay among site design, landscape design, and drainage design. **Several iterations may be needed** to optimize your drainage design as well as aesthetics, circulation, and use of available area for your site.

You should be able to complete the needed calculations using only the project's site development plan.

► STEP 1: DELINEATE DRAINAGE MANAGEMENT AREAS

This is the key first step. You must divide the **entire project area** into individual, discrete Drainage Management Areas (DMAs). Typically, lines delineating DMAs follow grade breaks and roof ridge lines. The drainage exhibit, tables, text, and calculations in your SWMP will illustrate, describe, and account for runoff from each of these areas.

Use separate DMAs for each surface type (e.g., landscaping, pervious paving, or roofs). Each DMA must be assigned a single hydrologic soil group. Assign each DMA an identification number and determine its size in square feet.

Rationale

Pollutants in rainfall and windblown dust will tend to become entrained in the vegetation and soils of landscaped areas, so no additional treatment is needed. It is assumed the self-treating landscaped areas will produce runoff less than or equal to the pre-project site condition.

► STEP 2: CLASSIFY DMAS AND DETERMINE RUNOFF FACTORS

Next, determine how drainage from each DMA will be handled. Each DMA will be one of the following four types:

1. Self-treating areas.
2. Self-retaining areas (also called “zero-discharge” areas).
3. Areas that drain to self-retaining areas.
4. Areas that drain to TCBMP/IMPs.

Self-treating areas are landscaped or turf areas that may or may not drain to TCBMP/IMPs, but typically drain directly off site or to the storm drain system. Examples include upslope undeveloped areas which are ditched and drained around a development and grassed slopes which drain off-site to a street or storm drain. In general, self-treating areas include no impervious areas, unless the impervious area is very small (5% or less) in relationship to the receiving pervious area and slopes are gentle enough to ensure runoff will be absorbed into the vegetation and soil. Criteria for self-treating areas are in the design sheet “Self Treating and Self-Retaining Areas” at the end of this Section.

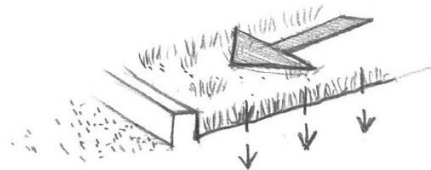


FIGURE 4-1. Self-treating areas are entirely pervious and drain directly off site or to the storm drain system

Self-retaining areas are designed to retain the first 1-inch of rainfall without producing any runoff. The technique works best on flat, heavily landscaped sites with compatible soils. It may be used on mild slopes if it can be demonstrated via calculations and soil properties that a 1-inch rainfall event over the contributory area would produce no runoff.

To create self-retaining turf and landscape areas in flat areas or on terraced slopes, berm the area or depress the grade into a concave cross-section so that these areas will retain the first inch of rainfall. Specify slopes, if any, toward the center of the pervious area. Inlets of area drains, if any, should be set 3 inches above the low point to allow ponding.

Criteria for self-retaining areas are in the design sheet “Self Treating and Self-Retaining Areas” following this section.

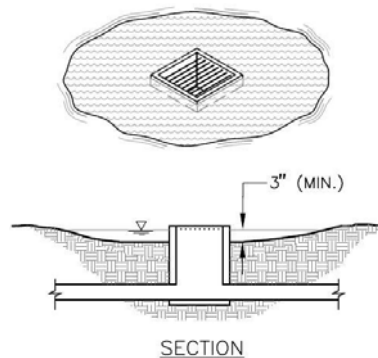


FIGURE 4-2. Self-retaining areas. Berm or depress the grade to retain at least an inch of rainfall and set inlets of any area drains at least 3 inches above low point to allow ponding.

Areas draining to self-retaining areas. Runoff from impervious or partially pervious areas can be managed by routing it to self-retaining pervious areas. For example, roof downspouts can be directed to lawns, and driveways can be sloped toward landscaped areas. The maximum ratio is 2 parts impervious area for every 1 part pervious area.

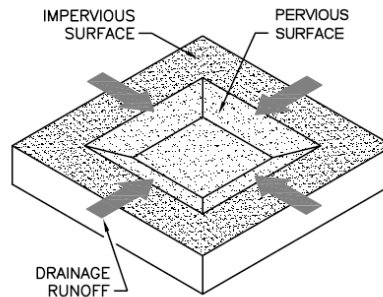


FIGURE 4-3. Relationship of impervious to pervious area for self-retaining areas. Ratio: *pervious* $\geq \frac{1}{2}$ *impervious*

The drainage from the impervious area must be directed to and dispersed within the pervious area, and the entire area must be designed to retain 1-inch of rainfall without flowing off-site. For example, if the maximum ratio of 2 parts impervious area into 1 part pervious area is used, then the pervious area must absorb 3 inches of water over its surface before overflowing to an off-site drain. Provide calculations as necessary (using soil characteristics) to demonstrate that 1-inch of rainfall over the study area can be absorbed into the native soil within 72-hours.

A partially pervious area may be drained to a self-retaining area. For example, a driveway composed of unit pavers may drain to an adjacent lawn. In this case, the maximum ratios are:

$$(\text{Runoff factor}) \times (\text{tributary area}) \leq 2 \times (\text{self-retaining area}) \quad \text{Equation 4-1}$$

Use the runoff factors in Table 4-2.

Prolonged ponding is a potential problem at higher impervious/pervious ratios. In your design, ensure that the pervious area soils can handle the additional run-on and are sufficiently well-drained.

Under some circumstances, pervious pavement (e.g., crushed stone, pervious asphalt, or pervious concrete) can be self-retaining. Adjacent roofs or impervious pavement may drain on to the pervious pavement in the same maximum ratios as described above.

To design a pervious pavement to be a self-treating area, ensure:

- A qualified engineer has been consulted regarding infiltration rates, pavement stability, and suitability for the intended traffic.
- The gravel base course is a minimum of four or more inches deep.
- Water must be shown to be absorbed into the native soil within 72-hours.
- Consider pavement design assuming 100-year storm events.

- Underdrains shall be elevated to allow water to infiltrate the treatment volume.

Runoff from self-treating and self-retaining areas does not require any further treatment or flow control.

TABLE 4-2. Runoff factors for surfaces draining to TCBMP/IMPs.

Surface	Factor
Roofs	1.0
Concrete/Asphalt	1.0
Grouted Unit Pavers	1.0
Solid Unit Pavers on granular base, min. 3/16 inch joint space	0.2
Pervious Concrete	0.1
Porous Asphalt	0.1
Crushed Aggregate	0.1
Turfblock	0.1
Amended, mulched soil	0.1
Landscape Areas	0.1

Areas draining to TCBMP/IMPs are multiplied by a sizing factor to calculate the required size of the TCBMP/IMP. On most densely developed sites—such as commercial and mixed-use developments and small-lot residential subdivisions—most DMAs will drain to TCBMP/IMPs.

More than one drainage area can drain to the same TCBMP/IMP. However, because the minimum TCBMP/IMP sizes are determined by ratio to drainage area size, a drainage area may not drain to more than one TCBMP/IMP. See Figures 4-4 and 4-5.

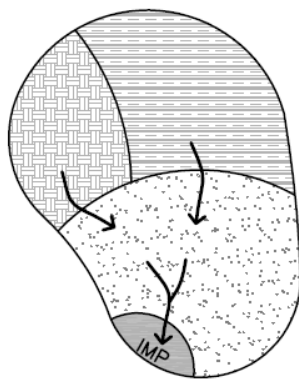


FIGURE 4-4. MORE THAN ONE Drainage Management Area can drain to a single IMP.

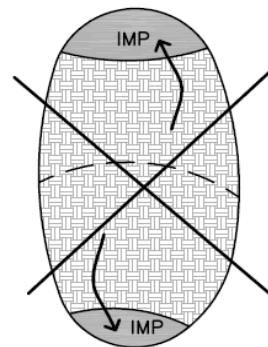


FIGURE 4-5. ONE DRAINAGE Management Area cannot drain to more than one IMP. Use a grade break to divide the DMA.

Where possible, design site drainage so **only impervious roofs and pavement** drain to TCBMP/IMPs. This yields a simpler, more efficient design and also helps protect TCBMP/IMPs from becoming clogged by sediment.

If it is necessary to include turf, landscaping, or pervious pavements within the area draining to an TCBMP/IMP, list each surface as a separate DMA. A runoff factor (similar to a “C” factor used in the rational method) is applied to account for the reduction in the quantity of runoff. For example, when a turf or landscaped drainage management area drains to an TCBMP/IMP, the resulting increment in TCBMP/IMP size is:

$$\Delta (\text{Area}) = (\text{pervious area}) \times (\text{runoff factor}) \times (\text{sizing factor}).$$

Use the runoff factors in Table 4-2.

► **STEP 3: TABULATE DRAINAGE MANAGEMENT AREAS**

- Tabulate self-treating areas in the format shown in Table 4-3.
- Tabulate self-retaining areas in the format shown in Table 4-4.
- Tabulate areas draining to self-retaining areas in the format shown in Table 4-5. Check to be sure the total product of (square feet of tributary area × runoff factor) for all DMAs draining to a receiving self-retaining area is no greater than a 2:1 ratio to the square footage of the receiving self-retaining area itself.
- Compile a list of DMAs draining to TCBMP/IMPs. Proceed to Step 4 to check the sizing of the TCBMP/IMPs.

TABLE 4-3. Format for Tabulating Self-Treating Areas

<i>DMA Name</i>	<i>Area (square feet)</i>

TABLE 4-4. Format for Tabulating Self-Retaining Areas

<i>DMA Name</i>	<i>Area (square feet)</i>

TABLE 4-5. Format for Tabulating Areas Draining to Self-Retaining Areas

<i>DMA Name</i>	<i>Area (square feet)</i>	<i>Post-project surface type</i>	<i>Runoff factor</i>	<i>Receiving self- retaining DMA</i>	<i>Receiving self- retaining DMA Area (square feet)</i>

► STEP 4: SELECT AND LAY OUT TCBMP/IMPS ON SITE PLAN

Select from the list of TCBMP/IMPs in Table 4-6. Illustrations, designs, and design criteria for the TCBMP/IMPs are in the “TCBMP/IMP Design Details and Criteria” at the end of this Section.

Once you have laid out the TCBMP/IMPs, calculate the square footage you have set aside on your site plan for each TCBMP/IMP.

► STEP 5: REVIEW SIZING FOR EACH TCBMP/IMP

For each of the TCBMP's, use the appropriate “water quality only” sizing factor from Table 4-6. If you need sizing factors for IMP's that provide both water quality treatment and hydromodification flow control refer to the sizing factors in the HMP found at www.projectcleanwater.org.

TABLE 4-6. TCBMP Sizing (Water Quality Treatment **Only**)

Bioretention Facilities	Sizing Factor for Area = 0.04
Flow-through Planters	Sizing Factor for Area = 0.04
Dry Well or Infiltration Basin	See Step 6 to Calculate Min. Volume
Cistern and Vaults with Bioretention	See Step 6 to Calculate Min. Volume of Cistern or Vault; then use 0.04 to calculate minimum size of bioretention area

► STEP 6: CALCULATE MINIMUM AREA AND VOLUME OF EACH IMP

The minimum area of bioretention facilities and flow-through planters is found by summing up the contributions of each tributary DMA and multiplying by the adjusted sizing factor for the IMP. Note that if you need sizing factors for IMP's to provide both water quality treatment and hydromodification flow controls refer to the sizing factors in the HMP found on www.projectcleanwater.org.

Equation 4-7

$$\text{Min. IMP Area} = \sum \left(\frac{\text{DMA Square Footage} \times \text{DMA Runoff Factor}}{\text{DMA Runoff Factor}} \right) \times \left(\frac{\text{IMP Sizing Factor}}{\text{IMP Sizing Factor}} \right)$$

Use the format of Table 4-7 to present the calculations of the required minimum area and volumes for **bioretention areas** and **planter boxes**:

TABLE 4-7. Format for presenting calculations of minimum TCBMP/IMP Areas for bioretention areas and planter boxes.

DMA Name	DMA Area (square feet)	Post-project surface type	DMA Runoff factor	DMA Area × runoff factor	Soil Type:	IMP Name		
					IMP Sizing factor (WQ only)	Minimum Area	Proposed Area	
Total					0.04			IMP Area

To size **dry wells, infiltration basins, or infiltration trenches for the “water quality treatment only” option**, use the following procedure:

1. Use the County of San Diego's 85th Percentile Isopluvial Map to determine the minimum unit volume.
2. Determine the weighted runoff factor (“C” factor) for the area tributary to the facility using the San Diego County Hydrology Manual, latest version. The factors in Table 4-2 may be used.
3. Multiply the weighted runoff factor times the tributary area times the minimum unit volume.

Equation 4-8

$$Volume = [Tributary Area] \times [weighted runoff factor] \times [unit volume]$$

4. Select a facility depth.
5. Determine the required facility area. Dry wells may be designed as an open vault or with rock fill. If rock fill is used, assume a porosity of 40%.
6. Using soil characteristics, demonstrate the facility can infiltrate the entire volume within the minimum drawdown time as determined by the governing jurisdiction.

To size a **cistern or vault in series with a bioretention facility (criteria below for “water quality treatment only” option)**:

1. Use Equation 4-8 to calculate the required cistern or vault volume.
2. Design a discharge orifice for a drawdown time of 24 hours.

3. Determine the maximum discharge from the orifice.
4. The minimum area of the bioretention facility must treat this flow based on a percolation rate of 5" per hour through the engineered soil.

For IMP facilities, which require both water quality treatment and hydromodification flow control, then refer to the appropriate sizing factors in the HMP for the correct IMP sizing factors. Refer to the final HMP at the project cleanwater website at www.projectcleanwater.org.

► **STEP 7: DETERMINE IF AVAILABLE SPACE FOR IMP IS ADEQUATE**

Sizing and configuring TCBMP/IMPs may be an iterative process. After computing the minimum TCBMP/IMP area using Steps 1 – 6, review the site plan to determine if the reserved TCBMP/IMP area is sufficient. If so, the planned TCBMP/IMPs will meet the SUSMP sizing requirements. If not, revise the plan accordingly. Revisions may include:

- Reducing the overall imperviousness of the project site.
- Changing the grading and drainage to redirect some runoff toward other TCBMP/IMPs which may have excess capacity.
- Making tributary landscaped DMAs self-treating or self-retaining.
- Expanding TCBMP/IMP surface area.

► **STEP 8: COMPLETE YOUR SUMMARY REPORT**

In your SWMP, present your TCBMP/IMP sizing calculations in tabular form. Adapt the following format as appropriate to your project. Coordinate your presentation of DMAs and calculation of minimum TCBMP/IMP sizes with the DMA/ TCBMP/IMP Exhibit (labeled to show delineation of DMAs and locations of TCBMP/IMPs). In the SWMP narrative, it is also helpful to incorporate a brief description of each DMA and each TCBMP/IMP.

Sum the total area of all DMAs and TCBMP/IMPs listed and show it is equal to the total project area. This step may include adjusting the square footage of some DMAs to account for area used for TCBMP/IMPs. See the sample summary report format below to be included in your SWMP:

DMA/ TCBMP/IMP summary report format:

I. Self-treating areas:

<i>DMA Name</i>	<i>Area (square feet)</i>

II. Self-retaining areas:

<i>DMA Name</i>	<i>Area (square feet)</i>

III. Areas draining to self-retaining areas:

<i>DMA Name</i>	<i>Post-project surface type</i>	<i>Runoff factor</i>	<i>Area (square feet)</i>	<i>Receiving self-retaining DMA</i>	<i>Receiving self-retaining DMA Area (square feet)</i>

IV. Areas draining to IMPs (repeat for each IMP):

					<i>Soil</i>		
<i>DMA Name</i>	<i>DMA Area (square feet)</i>	<i>Post-project surface type</i>	<i>DMA Runoff factor</i>	<i>DMA Area × runoff factor</i>	<i>Type:</i>	<i>TCBMP/IMP Name</i>	
					<i>IMP Sizing factor</i>	<i>Minimum Area or Volume</i>	<i>Proposed Area or Volume</i>
				<i>Total</i>			<i>IMP Area</i>

Incorporate TCBMP/IMP's to SUSMP Drawings

In your SWMP, describe your TCBMP/IMP's in sufficient detail to demonstrate the area, volume, and other criteria of each can be met within the constraints of the site.

Ensure that these details are consistent with your SUSMP Drawings, which may include: site plans, grading plans, improvement plans, landscaping plans, and building plans submitted with your application.

At the end of this Section are design sheets for:

- Self-treating and self-retaining areas
- Pervious pavements
- Bioretention facilities

- Flow-through planter
- Dry wells and infiltration basins
- Cistern with bioretention facility

These design sheets include recommended configurations and details, and example applications, for these TCBMP/IMPs. **The information in these design sheets must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.**

Keep in mind that proper and functional design of the TCBMP/IMP is the responsibility of the applicant. Effective operation of the TCBMP/IMP throughout the project's lifetime will be the responsibility of the property owner.

Alternatives to Integrated LID Design

If you believe that the design of features and facilities as described above is infeasible for your development site, consider an alternative design to show how your projects (separately) meets all three applicable stormwater criteria: 1) LID criteria, 2) Stormwater treatment (numeric) requirements, and 3) Flow control (hydromodification) requirements.

For all alternative designs, the applicant must still prepare a complete SWMP per the SWMP requirements checklist, including DMA exhibits showing the entire site divided into discrete Drainage Management Areas. The SWMP must include text, narrative on pollutants, BMP selection, effectiveness and applicability. The SWMP must include tables showing how drainage is routed from each DMA to a treatment control BMP facility, and numeric sizing calculations (flow or volume based) demonstrating that the design achieves the applicable design criteria for each stormwater treatment facility. The SWMP must also incorporate measures to demonstrate how the project meets the minimum LID criteria.

The SWMP must also demonstrate, via pre- and post-development hydrology calculations that runoff rates, durations, and velocities are controlled to maintain or reduce downstream erosion conditions and protect stream habitat (Municipal Permit Provision D.1.d.(10)). Refer to the SWMP requirements checklist.

► DESIGN OF ALTERNATIVE TREATMENT CONTROL FACILITIES

Here are criteria and design considerations for some alternative treatment control facilities to satisfy numeric sizing requirements per the Municipal Permit:

Vegetated Swales. Design recommendations for conventional vegetated swales are in the [*California Stormwater Best Management Practices Handbooks*](#). The conventional swale design uses available on-site soils and does not include an underdrain system. Where soils are clayey, there is little infiltration. Treatment occurs as runoff flows through grass or other vegetation before exiting at the downstream end. Recommended detention times are on the order of 10 minutes. It

should be noted that such designs would not provide the required hydromodification flow control benefit.

Conventional vegetated swales may be used to meet Municipal Permit treatment requirements and Standard Stormwater (minimum LID) requirements. The following should be incorporated in the design:

- Determine the weighted runoff factor (“C” factor) for the area tributary to the swale. The factors in Table 4-2 may be used.
- Calculate the design flow by multiplying the weighted runoff factor times the tributary area times either (1) 0.2 inches of rainfall per hour, or (2) twice the 85th percentile hourly rainfall intensity. Consider using the water quality-only sizing factors for linear bioretention basin (see Section 4).
- When sizing the swale, use a value of 0.25 for Manning’s “n”.
- Ensure that all flow enters the swale near its highest point and that no flow short-circuits treatment by entering the swale along its length.
- The swale should be a minimum 100 feet in length.
- Longitudinal slopes should not exceed 2.5%; on flatter slopes, incorporate measures to avoid prolonged surface ponding.

Bioretention. Consider using linear-shaped bioretention areas (see page 86) in place of conventional vegetated swales because:

- Conventional swale design has resulted in standing water and associated nuisances.
- Conventional swales often don’t obtain even the design residence time because of the length required and because proper design requires runoff enter the swale at the upstream end rather than at various locations along its length, and
- Bioretention areas provide a more flexible drainage design, more effective practicable treatment, and more effective flow control within the same footprint.

Sand Filters. To ensure effectiveness is not compromised by compacting or clogging of the filter surface, sand filters must be maintained frequently.

The following criteria apply to sand filters:

- Calculate the design flow using the rational method with an intensity of 0.2"/hour and the “C” factors for “treatment only” from Table 4-2.

- To determine the required filter surface area, divide the design flow by an allowable design surface loading rate of 5"/hour.
- The minimum depth of filter media is 18". The media should be washed sand, with gradation similar to that specified for fine aggregate in ASTM C-33.
- The entire filter area must be accessible for easy maintenance without the need to enter a confined space.

A typical filter design includes a gravel drain layer and a perforated pipe underdrain. Filter fabric may be used to prevent the filter media from entering the gravel layer.

The design should not include any permanent pool or other standing water. Instead of including a pretreatment basin, consider the following features in the area tributary to the filter to reduce the potential for filter clogging:

- Limit the size of the Drainage Management Area.
- Include only impervious areas in the DMA.
- Stabilize slopes and eliminate sources of sediment in the DMA.
- Provide screens for trash and leaves at storm drain inlets (if allowed by municipality).

For additional design considerations and details, see [*Design of Stormwater Filtering Systems*](#) by Richard A. Claytor and Thomas R. Schueler, The Center for Watershed Protection, 1996, and *California Stormwater BMP Handbooks* Fact Sheet TC-40, Media Filter.

Sand filters do not provide adequate hydromodification flow controls.

Extended ("Dry") Detention Basins. The required detention volume for water quality treatment is based on the 85th percentile 24-hour storm depth. The steps to calculate the required detention volume are:

1. Use the County of San Diego's 85th Percentile Isopleth Map to determine the unit basin volume.
2. Determine the weighted runoff factor ("C" factor) for the area tributary to the basin. The factors in Table 4-2 may be used.
3. Multiply the weighted runoff factor times the tributary area times the unit basin volume.

For maximum effectiveness the basin should not be sized substantially larger than this volume. If the basin is to be used for hydromodification flow control, then the BMP Sizing Calculator pond sizer or a continuous simulation model must be used to prove the basin meets peak flow and flow duration criteria.

For design considerations and details, see the [California Stormwater Best Management Practice Handbooks](#), Fact Sheet TC-22, “Extended Detention Basins.” The basin outlet should be designed for a 24-hour drawdown time.

As noted in Fact Sheet TC-22, “dry” detention basins may not be practicable for drainage areas less than 5 acres. The potential for mosquito harborage is a concern. In the design, do not create any areas that will hold standing water for time periods in excess of the maximum vector control detention time (96 hours for the County of San Diego).

“Wet” Detention Ponds and Constructed Wetlands. The required water quality detention volume is determined as with a “dry” detention basin. Before proceeding with design, contact the local mosquito control agency to coordinate the design and plan ongoing inspection and maintenance of the facility for mosquito control. For design considerations and details, see the [California Stormwater Best Management Practices Handbooks](#), Fact Sheet TC-20, “Wet Ponds,” and Fact Sheet TC-21, “Constructed Wetlands.”

► OTHER TREATMENT FACILITIES FOR SPECIAL CIRCUMSTANCES

For projects not subject to hydromodification or those that have separate hydromodification facilities, higher-rate surface filters and vault-based proprietary filters can only be used in the circumstances described beginning on page 25 and when sand filters, extended “dry” detention basins, and “wet” detention ponds or constructed wetlands have been found infeasible.

As part of your stormwater design, you should still explore incorporating LID criteria such as vegetated swales or other BMP’s in a treatment train to enhance the effectiveness of treatment control BMP’s at removing the target pollutants from your project.

For surface filters, the grading and drainage design should minimize the area draining to each unit and maximize the number of discrete drainage areas and units. Proprietary facilities should be installed consistent with the manufacturer’s instructions.

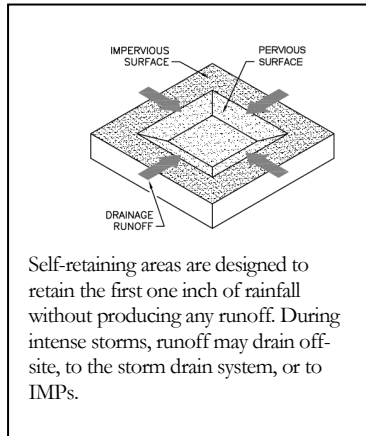
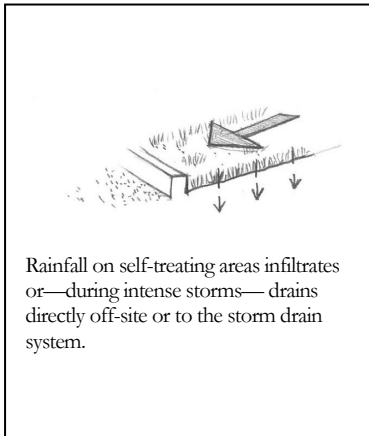
Such facilities do not satisfy flow control (hydromodification) requirements.

References and Resources:

- [RWQCB Order R9-2007-0001 \(Municipal Permit\)](#)
- [Low Impact Development Center](#)
- [County of San Diego Low Impact Development Handbook](#)
- [California Best Management Practices Handbooks](#)
- [Design of Stormwater Filtering Systems](#) (Claytor and Scheuler, 1996)
- [American Rainwater Catchment Systems Association](#)
- [Water Conservation Alliance of Southern Arizona](#)
- [Rainwater Harvesting for Drylands and Beyond](#)
- [The Texas Manual on Rainwater Harvesting](#)
- *Managing Wet Weather With Green Infrastructure: Municipal Handbook, Rainwater Harvesting Policies* (Low Impact Development Center, 2008)

Self-Treating and Self-Retaining Areas

► CRITERIA



LID design seeks to manage runoff from roofs and paving so effects on water quality and hydrology are minimized. Runoff from landscaping, however, does not need to be managed the same way.

Runoff from landscaping can be managed by creating self-treating and self-retaining areas.

Self-treating areas are natural, landscaped, or turf areas that drain directly off site or to the storm drain system. Examples include upslope undeveloped areas that are ditched and drained around a development and grassed slopes that drain offsite to a street or storm drain. Self-treating areas may not drain on to adjacent paved areas.

Where a landscaped area is upslope from or surrounded by paved areas, a **self-retaining area** (also called a zero-discharge area) may be created. Self-retaining areas are designed to retain the first one inch of rainfall without producing any runoff. The technique works best on flat, heavily landscaped sites. It may be used on mild slopes if there is a reasonable expectation that the first inch of rainfall would produce no runoff.

To create self-retaining turf and landscape areas in flat areas or on terraced slopes, berm the area or depress the grade into a concave cross-section so that these areas will retain the first inch of rainfall. Inlets of area drains, if any, should be set 3 inches above the low point to allow ponding.

Areas draining to self retaining areas. Provided that onsite soil infiltration rates are verified by the Geotechnical Engineer, then drainage from roofs and paving can be directed to self-retaining areas and allowed to infiltrate into the soil. The maximum allowable ratio is 2 parts impervious: 1 part pervious.

Best Uses

- Heavily landscaped sites

Advantages

- Complements site landscaping

Limitations

- Requires substantial square footage
- Requires soil information with adequate drainage
- Need drainage overflow design
- Grading requirements must be coordinated with landscape design

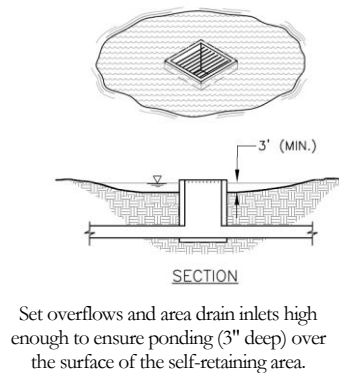
The self-retaining area must be bermed or depressed to retain an inch of rainfall including the flow from the tributary impervious area.

► **DETAILS**

Drainage from self-treating areas must flow to off-site streets or storm drains without flowing on to paved areas.

Pavement within a self-treating area cannot exceed 5% of the total area.

In self-retaining areas, overflows and area drain inlets should be set high enough to ensure ponding over the entire surface of the self-retaining area.



Self-retaining areas should be designed to promote even distribution of ponded runoff over the area.

Leave enough reveal (from pavement down to landscaped surface) to accommodate buildup of turf or mulch.

► **APPLICATIONS**

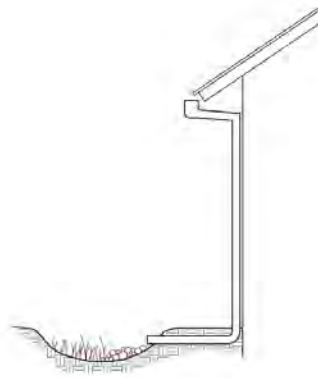
Well-draining soil supported by soil percolation rates verified by Geotechnical Engineer

Lawn or landscaped areas adjacent to streets can be considered self-treating areas.

Self-retaining areas can be created by depressing lawn and landscape below surrounding sidewalks and plazas.

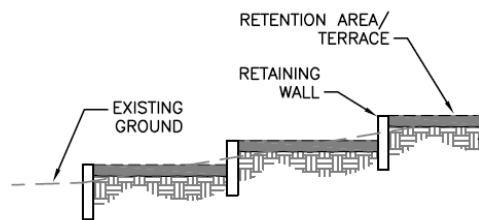
Runoff from walkways or driveways in parks and park-like areas can sheet-flow to self-retaining areas.

Roof leaders can be connected to self-retaining areas by piping beneath plazas and walkways. If necessary, a “bubble-up” can be used.



Connecting a roof leader to a self-retaining area. The head from the eave height makes it possible to route roof drainage some distance away from the building. Coordinate with soils engineer as necessary

Self-retaining areas can be created by terracing mild slopes. The elevation difference promotes subsurface drainage.



Mild slopes can be terraced to create self-retaining areas.

► DESIGN CHECKLIST FOR SELF-TREATING AREAS

- ☐ The self-treating area is at least 95% lawn or landscaping (not more than 5% impervious).
- ☐ Re-graded or re-landscaped areas have amended soils, vegetation, and irrigation as may be required to maintain soil stability and permeability.
- ☐ Runoff from the self-treating area does not enter a TCBMP/IMP or another drainage management area, but goes directly to the storm drain system.

► **DESIGN CHECKLIST FOR SELF-RETAINING AREAS**

- ☐ Area is bermed all the way around or graded concave.
- ☐ When impervious area is directed to a self retaining area, provide volume calculations to show that 1-inch of rainfall over the study area can be retained.
- ☐ Slopes do not exceed 4%.
- ☐ Entire area is lawn, landscaping, or pervious pavement (see criteria in Section 4).
- ☐ Area has amended soils, vegetation, and irrigation as may be required to maintain soil stability and permeability.
- ☐ Provide soil percolation rates and design details to show that self retaining area will drain properly after a storm event (within 72-hours or as determined by County Health Department) and will handle larger storm events.
- ☐ Any area drain inlets are at least 3-inches above surrounding grade.
- ☐ When self-retaining area become large, select and size a TCBMP/IMP to treat the runoff.

► **DESIGN CHECKLIST FOR AREAS DRAINING TO SELF-RETAINING AREAS**

- ☐ Ratio of tributary impervious area to self-retaining area is not greater than 2:1.
- ☐ Roof leaders collect runoff and route it to the self-retaining area.
- ☐ Paved areas are sloped so drainage is routed to the self-retaining area.
- ☐ Outlets/Inlets are designed to protect against erosion and distribute runoff across the area.
- ☐ Design accommodates 100-year event as well as treatment volumes

Pervious Pavements

► CRITERIA

Impervious roadways, driveways, and parking lots account for much of the hydrologic impact of land development. In contrast, pervious pavements allow rainfall to collect in a gravel or sand base course and infiltrate into native soil.

Pervious pavements are designed to transmit rainfall through the surface to storage in a base course. For example, a 4-inch-deep base course provides approximately 1.6 inches of storage. Runoff stored in the base course infiltrates to native soils over time. Except in the case of solid pavers, the surface course provides additional storage.

Areas with the following pervious pavements may be regarded as “self-treating” and require no additional treatment or flow control if they drain off-site (not to an TCBMP/IMP).

- Pervious concrete
- Porous asphalt
- Crushed aggregate (gravel)
- Open pavers with grass or plantings
- Open pavers with gravel
- Artificial turf

Areas with these pervious pavements can also be **self-retaining areas** and may receive runoff from impervious areas if they are bermed or depressed to retain the first one inch of rainfall, including runoff from the tributary impervious area. To be self-retaining, the base course shall not be drained.

Solid unit pavers—such as bricks, stone blocks, or precast concrete shapes—are considered to reduce runoff compared to impervious pavement, when the unit pavers are set in sand or gravel with ¼" gaps between the pavers. Joints must be filled with an open-graded aggregate free of fines. When draining pervious pavements to an TCBMP/IMP, use the runoff factors in Table 4-2.

Best Uses

- Areas with permeable native soils
- Low-traffic areas
- Where aesthetic quality can justify higher cost

Advantages

- Reduces DMA factors for stormwater design
- Variety of surface treatments can complement landscape design

Limitations

- Initial cost
- Placement requires specially trained crews
- Geotechnical concerns, especially in clay soils
- Concerns about pavement strength and surface integrity
- May not be allowed in public right of way unless specifically approved

► DETAILS

Permeable pavements can be used in clay soils; however, special design considerations, including an increased depth of base course, typically apply and will increase the cost of this option. Geotechnical fabric between the base course and underlying clay soil is recommended. Include calculations that demonstrate that retaining storm water in the base course will be absorbed into underlying soil within 72-hours.

Pavement strength and durability typically determines the required depth of base course. If underdrains are used, the outlet elevation must be installed at the height necessary to detain the treatment volume required in the base course.

Pervious concrete and porous asphalt must be installed by crews with special training and tools. Industry associations maintain lists of qualified contractors.

Parking lots with crushed aggregate or unit pavers may require signs or bollards to organize parking.

► DESIGN CHECKLIST FOR PERVIOUS PAVEMENTS

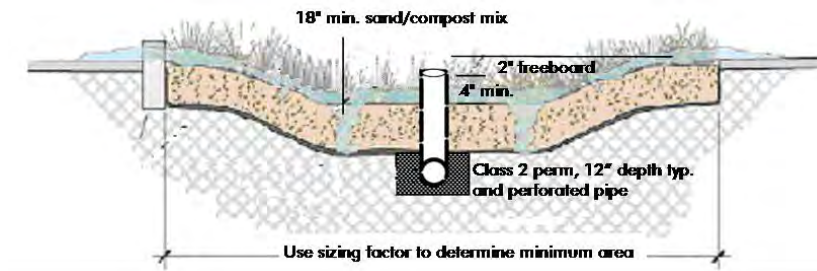
- ☐ No erodible areas drain on to pavement.
- ☐ Subgrade is uniform. Compaction is minimal.
- ☐ Reservoir base course is of open-graded crushed stone. Base depth is adequate to retain rainfall treatment volume and support design loads.
- ☐ If a subdrain is provided, outlet elevation is installed at the height necessary to detain the treatment volume required in of base course.
- ☐ Subgrade is uniform and slopes are not so steep that subgrade is prone to erosion.
- ☐ Rigid edge is provided to retain granular pavements and unit pavers.
- ☐ Solid unit pavers are installed with open gaps filled with open-graded aggregate free of fines.
- ☐ Permeable pavements are installed by industry-certified professionals according to vendor's recommendations.
- ☐ Selection and location of pavements incorporates Americans with Disabilities Act requirements, site aesthetics, and uses.
- ☐ Design accommodates 100-year event as well as treatment volumes

Resources

- Southern California Concrete Producers www.concreteresources.net.
- California Asphalt Pavement Association
<http://www.californiapavements.org/stormwater.html>
- Interlocking Concrete Pavement Institute
<http://www.icpi.org/>
- *Start at the Source Design Manual for Water Quality Protection*, pp. 47-53. www.basmaa.org
- *Porous Pavements*, by Bruce K. Ferguson. 2005. ISBN 0-8493-2670-2.

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Bioretention Facilities



Bioretention facility configured for treatment-only requirements. Bioretention facilities can be rectangular, linear, or nearly any shape.

Bioretention detains runoff in a surface reservoir, filters it through plant roots and a biologically active soil mix, and then infiltrates it into the ground. Where native soils are less permeable, an underdrain conveys treated runoff to storm drain or surface drainage.

Bioretention facilities can be configured in nearly any shape. When configured as linear **swales**, they can convey high flows while percolating and treating lower flows.

Bioretention facilities can be configured as in-ground or above-ground planter boxes, with the bottom open to allow infiltration to native soils underneath. If infiltration cannot be allowed, use the sizing factors and criteria for the Flow-Through Planter.

► CRITERIA

For development projects subject only to runoff treatment requirements, the following criteria apply:

Parameter	Criterion
Soil mix depth	18 inches minimum
Soil mix minimum percolation rate	5 inches per hour minimum sustained (10 inches per hour initial rate recommended)
Soil mix surface area	0.04 times tributary impervious area (or equivalent)

Best Uses

- Commercial areas
- Residential subdivisions
- Industrial developments
- Roadways
- Parking lots
- Fit in setbacks, medians, and other landscaped areas

Advantages

- Can be any shape
- Low maintenance
- Can be landscaped

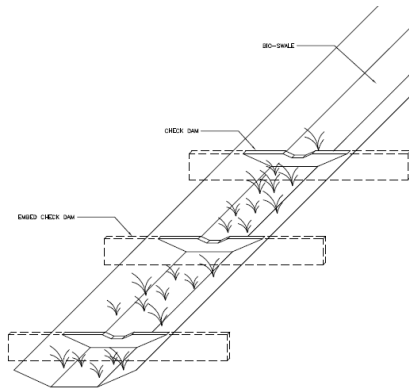
Limitations

- Require 4% of tributary impervious square footage
- Typically requires 3-4 feet of head
- Irrigation typically required

Parameter	Criterion
Surface reservoir depth	6 inches minimum; may be sloped to 4 inches where adjoining walkways.
Underdrain	Required in Group “C” and “D” soils. Perforated pipe embedded in gravel (“Class 2 permeable” recommended), connected to storm drain or other accepted discharge point.

► DETAILS

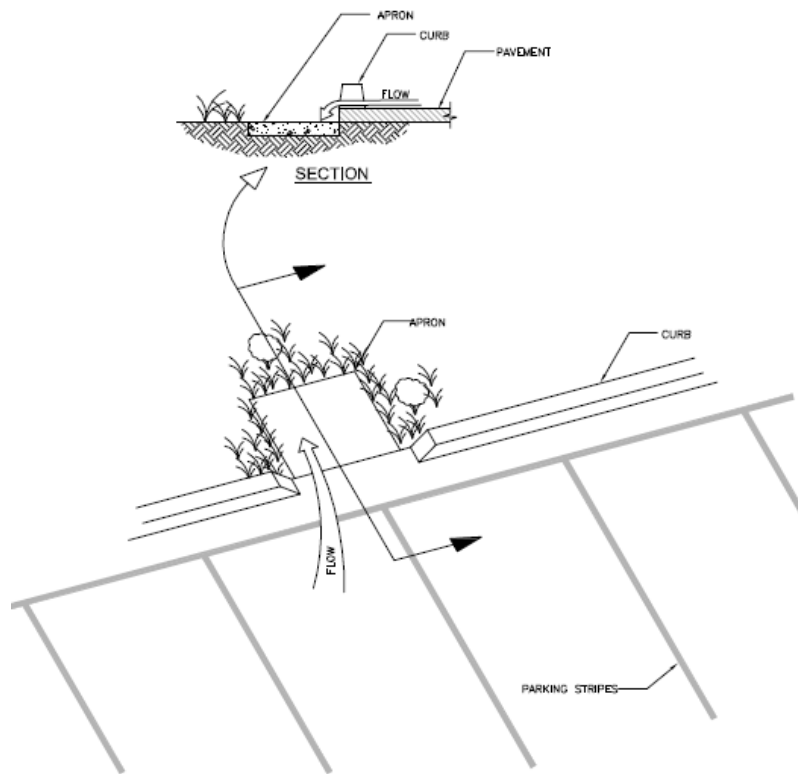
Plan. On the surface, a bioretention facility should be one level, shallow basin—or a series of basins. As runoff enters each basin, it should flood and fill throughout before runoff overflows to the outlet or to the next downstream basin. This will help prevent movement of surface mulch and soil mix.



Use check dams for linear bioretention facilities (swales) on a slope.

In a linear swale, check dams should be placed so that the lip of each dam is at least as high as the toe of the next upstream dam. A similar principle applies to bioretention facilities built as terraced roadway shoulders.

Inlets. Paved areas draining to the facility should be graded, and inlets should be placed, so that runoff remains as sheet flow or as dispersed as possible. Curb cuts should be wide (12" is recommended) to avoid clogging with leaves or debris. Allow for a minimum reveal of 4"-6" between the inlet and soil mix elevations to ensure turf or mulch buildup does not block the inlet. In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet.



Recommended design details for bioretention facility inlets (see text).

Where runoff is collected in pipes or gutters and conveyed to the facility, protect the landscaping from high-velocity flows with energy-dissipating rocks. In larger installations, provide cobble-lined channels to better distribute flows throughout the facility.

Upturned pipe outlets can be used to dissipate energy when runoff is piped from roofs and upgradient paved areas.

Soil mix. The required soil mix is similar to a loamy sand. It must maintain a minimum percolation rate of 5" per hour throughout the life of the facility, and it must be suitable for maintaining plant life. Typically, on-site soils will not be suitable due to clay content.

Storage and drainage layer. "Class 2 permeable," Caltrans specification 68-1.025, is recommended. Open-graded crushed rock, washed, may be used, but requires 4"-6" washed pea gravel be substituted at the top of the crushed rock gravel layers. **Do not use filter fabric** to separate the soil mix from the gravel drainage layer or the gravel drainage layer from the native soil.

Underdrains. No underdrain is required where native soils beneath the facility are Hydrologic Soil Group A or B. For treatment-only facilities where native soils are Group C or D, a perforated pipe must be bedded in the gravel layer and must terminate at a storm drain or other approved discharge point.

Outlets. In treatment-only facilities, outlets must be set high enough to ensure the surface reservoir fills and the entire surface area of soil mix is flooded before the outlet elevation is reached. In swales, this can be achieved with appropriately placed check dams.

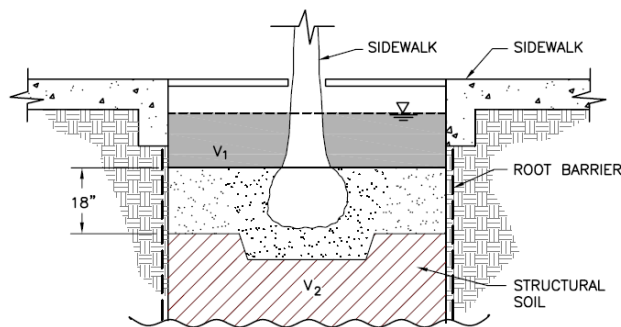
The outlet should be designed to exclude floating mulch and debris.

Vaults, utility boxes and light standards. It is best to locate utilities outside the bioretention facility—in adjacent walkways or in a separate area set aside for this purpose. If utility structures are to be placed within the facility, the locations should be anticipated and adjustments made to ensure the minimum bioretention surface area and volumes are achieved. Leaving the final locations to each individual utility can produce a haphazard, unaesthetic appearance and make the bioretention facility more difficult to maintain.

Emergency overflow. The site grading (construction) plan shall include details that demonstrate the bioretention basin can handle larger (up to 100-year) storm events and address potential clogging of the overflow and route emergency overflows safely.

Trees. Bioretention areas can accommodate small or large trees. There is no need to subtract the area taken up by roots from the effective area of the facility. Extensive tree roots maintain soil permeability and help retain runoff. Normal maintenance of a bioretention facility should not affect tree lifespan.

The bioretention facility can be integrated with a tree pit of the required depth and filled with structural soil. If a root barrier is used, it can be located to allow tree roots to spread throughout the bioretention facility while protecting adjacent pavement. Locations and planting elevations should be selected to avoid blocking the facility's inlets and outlets.



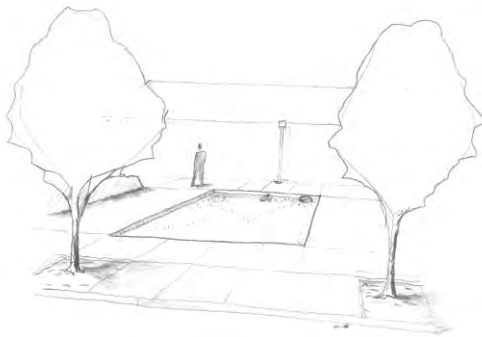
Bioretention facility configured as a tree well.
The root barrier is optional.

► APPLICATIONS

Multi-purpose landscaped areas. Bioretention facilities are easily adapted to serve multiple purposes. The loamy sand soil mix will support turf or a plant palette suitable to the location and a well-drained soil.

Example landscape treatments:

- Lawn with sloped transition to adjacent landscaping.
- Swale in setback area
- Swale in parking median
- Lawn with hardscaped edge treatment
- Decorative garden with formal or informal plantings
- Traffic island with low-maintenance landscaping
- Raised planter with seating
- Bioretention on a terraced slope



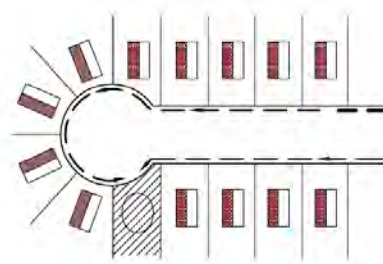
Bioretention facility configured as a recessed decorative lawn with hardscaped edge.



Bioretention facility configured and planted as a lawn/ play area.

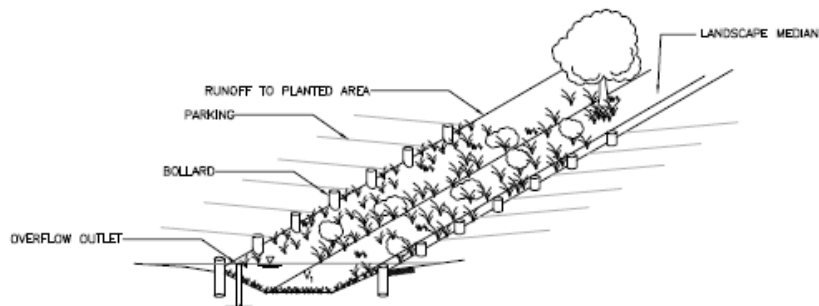
Residential subdivisions. Some subdivisions are designed to drain roofs and driveways to the streets (in the conventional manner) and then drain the streets to bioretention areas, with one bioretention area for each 1 to 6 lots, depending on subdivision layout and topography.

Bioretention areas may be placed on separate, jointly-owned parcel(s).



Bioretention facility receiving drainage from individual lots and the street in a residential subdivision.

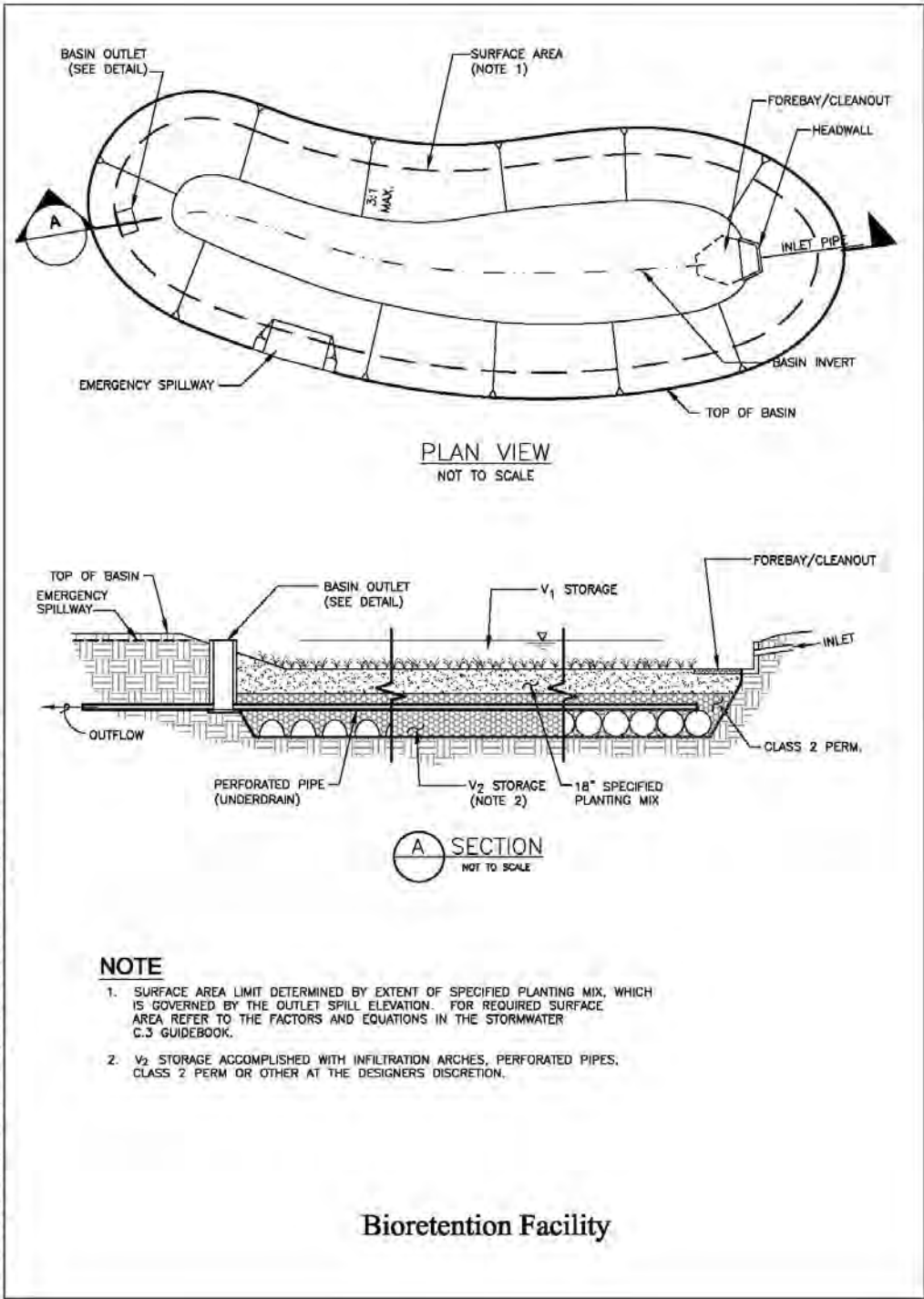
Sloped sites. Bioretention facilities must be constructed as a basin, or series of basins, with the circumference of each basin set level. It may be necessary to add curbs or low retaining walls.

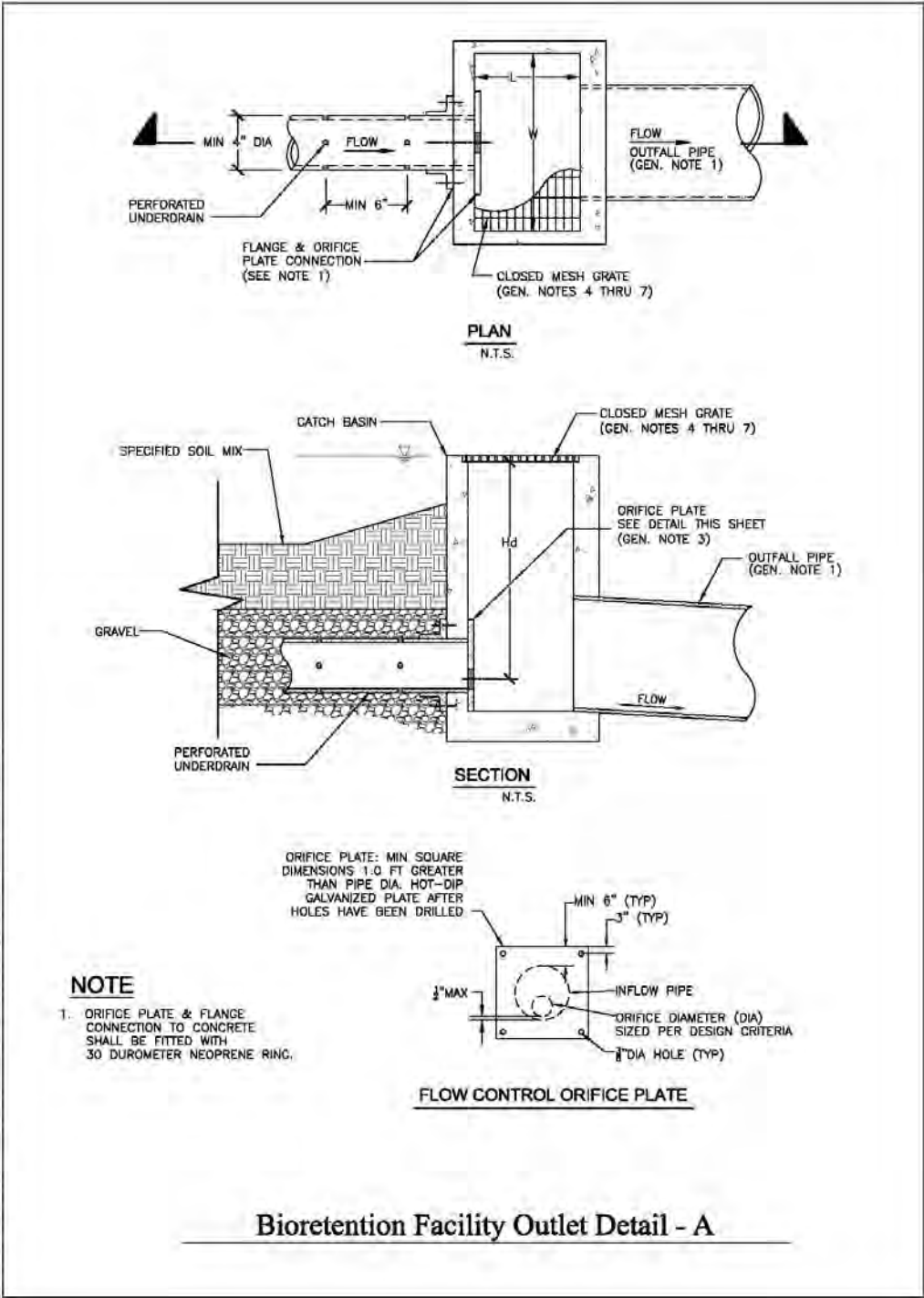


Bioretention facility configured as a parking median.
Note use of bollards in place of curbs, eliminating the need for curb cuts.

Design Checklist for Bioretention

- ☐ Volume or depth of surface reservoir meets or exceeds minimum.
- ☐ 18" depth "loamy sand" soil mix with minimum long-term percolation rate of 5"/hour.
- ☐ Area of soil mix meets or exceeds minimum.
- ☐ Perforated pipe underdrain bedded in "Class 2 perm" with connection and sufficient head to storm drain or discharge point (except in "A" or "B" soils).
- ☐ No filter fabric.
- ☐ Underdrain has a clean-out port consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a watertight cap.
- ☐ Location and footprint of facility are shown on site plan and landscaping plan.
- ☐ Bioretention area is designed as a basin (level edges) or a series of basins, and grading plan is consistent with these elevations. If facility is designed as a swale, check dams are set so the lip of each dam is at least as high as the toe of the next upstream dam.
- ☐ Inlets are 12" wide, have 4"-6" reveal and an apron or other provision to prevent blockage when vegetation grows in, and energy dissipation as needed.
- ☐ Overflow connected to a downstream storm drain or approved discharge point.
- ☐ Emergency spillage will be safely conveyed overland.
- ☐ Plantings are suitable to the climate and a well-drained soil.
- ☐ Irrigation system with connection to water supply.
- ☐ Vaults, utility boxes, and light standards are located outside the minimum soil mix surface area.
- ☐ When excavating, avoid smearing of the soils on bottom and side slopes. Minimize compaction of native soils and "rip" soils if clayey and/or compacted. Protect the area from construction site runoff.





Flow-through Planter



Portland 2004 Stormwater Manual

Flow-through planters treat and detain runoff without allowing seepage into the underlying soil. They can be used next to buildings and on slopes where stability might be affected by adding soil moisture.

Flow-through planters typically receive runoff via downspouts leading from the roofs of adjacent buildings. However, they can also be set in-ground and receive sheet flow from adjacent paved areas.

Pollutants are removed as runoff passes through the soil layer and is collected in an underlying layer of gravel or drain rock. A perforated-pipe underdrain is typically connected to a storm drain or other discharge point. An overflow inlet conveys flows which exceed the capacity of the planter.

► CRITERIA

Treatment only. For development projects subject only to runoff treatment requirements, the following criteria apply:

Parameter	Criterion
Soil mix depth	18 inches minimum
Soil mix minimum percolation rate	5 inches per hour minimum sustained (10 inches per hour initial rate recommended)

Best Uses

- Management of roof runoff
- Next to buildings
- Dense urban areas
- Where infiltration is not desired

Advantages

- Can be used next to structures
- Versatile
- Can be any shape
- Low maintenance

Limitations

- Can be used for flow-control only on sites with “C” and “D” soils
- Requires underdrain
- Requires 3-4 feet of head

Parameter	Criterion
Soil mix surface area	0.04 times tributary impervious area (or equivalent)
Surface reservoir depth	6" minimum; may be sloped to 4" where adjoining walkways.
Underdrain	Typically used. Perforated pipe embedded in gravel ("Class 2 permeable" recommended), connected to storm drain or other accepted discharge point.

► DETAILS

Configuration. The planter must be level. To avoid standing water in the subsurface layer, set the perforated pipe underdrain and orifice as nearly flush with the planter bottom as possible.

Inlets. Protect plantings from high-velocity flows by adding rocks or other energy-dissipating structures at downspouts and other inlets.

Soil mix. The required soil mix is similar to a loamy sand. It must maintain a minimum percolation rate of 5" per hour throughout the life of the facility, and it must be suitable for maintaining plant life. Typically, on-site soils will not be suitable due to clay content.

Gravel storage and drainage layer. "Class 2 permeable," Caltrans specification 68-1.025, is recommended. Open-graded crushed rock, washed, may be used, but requires 4"-6" of washed pea gravel be substituted at the top of the crushed rock layer. **Do not use filter fabric** to separate the soil mix from the gravel drainage layer.

Emergency overflow. The planter design and installation should anticipate extreme events and potential clogging of the overflow and route emergency overflows safely.

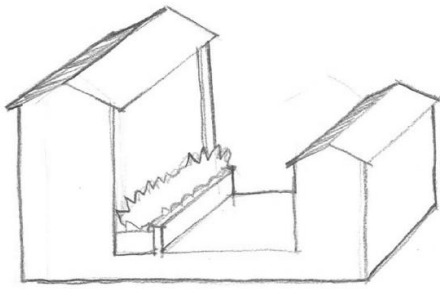
► APPLICATIONS

Adjacent to buildings. Flow-through planters may be located adjacent to buildings, where the planter vegetation can soften the visual effect of the building wall. A setback with a raised planter box may be appropriate even in some neo-traditional pedestrian-oriented urban streetscapes.

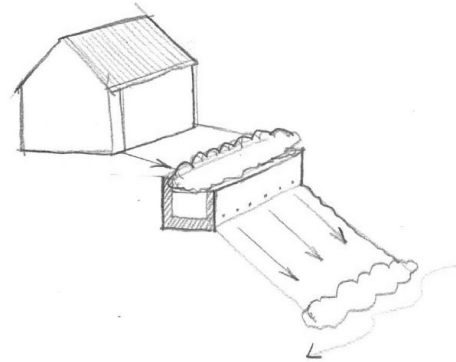
At plaza level. Flow-through planters have been successfully incorporated into podium-style developments, with the planters placed on the plaza level and receiving runoff from the tower roofs above. Runoff from the plaza level is typically managed separately by additional flow-through planters or bioretention facilities located at street level.

Steep slopes. Flow-through planters provide a means to detain and treat runoff on slopes that cannot accept infiltration from a bioretention facility. The planter can be built into the slope similar to a retaining wall. The design should consider the need to access the planter for periodic

maintenance. Flows from the planter underdrain and overflow must be directed in accordance with local requirements. It is sometimes possible to disperse these flows to the downgradient hillside.



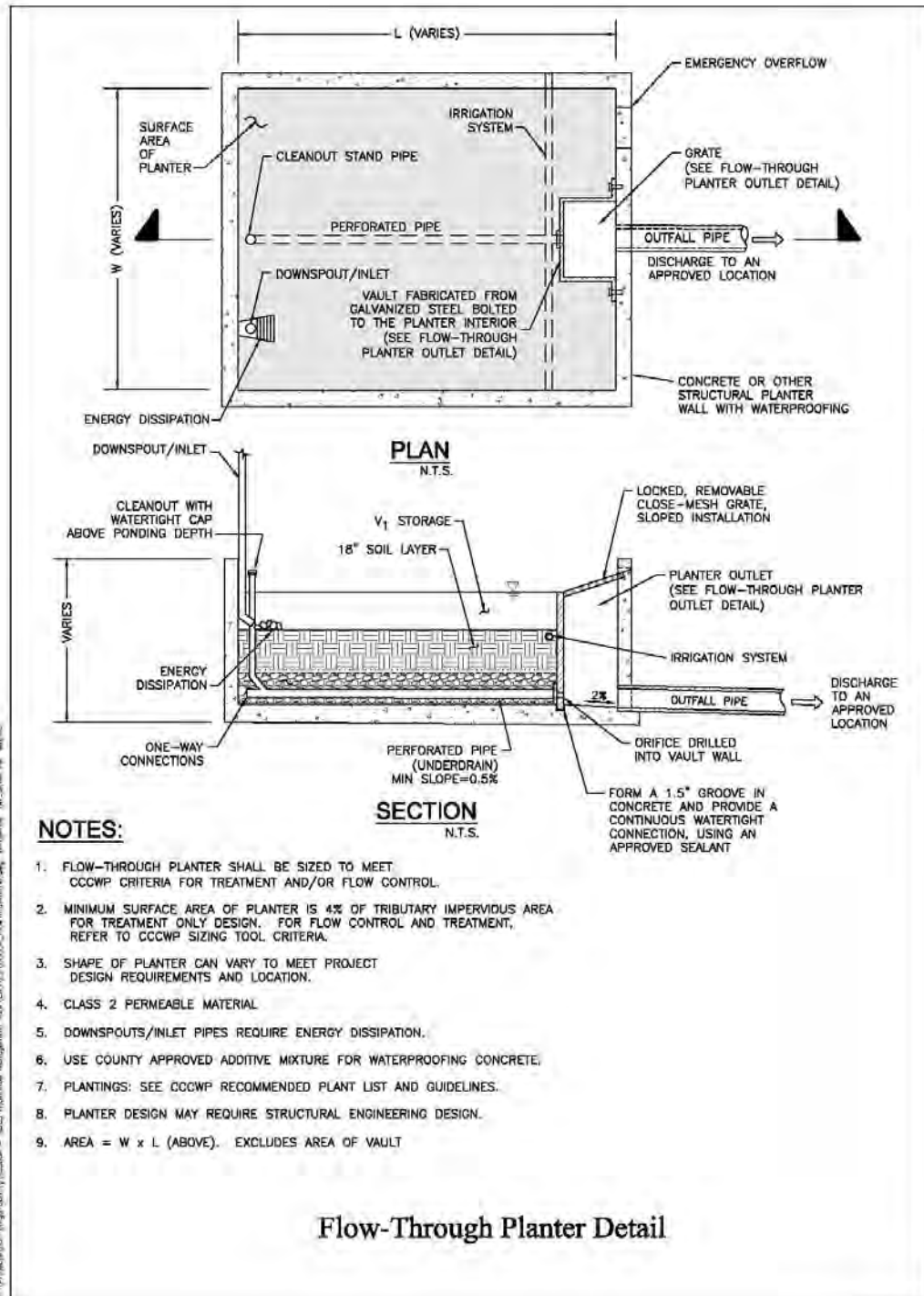
Flow-through planter on the plaza level of a podium-style development.



Flow-through planter built into a hillside. Flows from the underdrain and overflow must be directed in accordance with local requirements.

Design Checklist for Flow-through Planter

- ☐ Reservoir depth is 4-6" minimum.
- ☐ 18" depth "loamy sand" soil mix with minimum long-term infiltration rate of 5"/hour.
- ☐ Area of soil mix meets or exceeds minimum.
- ☐ "Class 2 perm" drainage layer.
- ☐ No filter fabric.
- ☐ Perforated pipe underdrain with outlet located flush or nearly flush with planter bottom. Connection with sufficient head to storm drain or discharge point.
- ☐ Underdrain has a clean-out port consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a watertight cap.
- ☐ Overflow connected to a downstream storm drain or approved discharge point.
- ☐ Location and footprint of facility are shown on site plan and landscaping plan.
- ☐ Planter is set level.
- ☐ Emergency spillage will be safely conveyed overland.
- ☐ Plantings are suitable to the climate and a well-drained soil.
- ☐ Irrigation system with connection to water supply.





- ### Flow-Through Planter Outlet Detail

Dry Wells and Infiltration Basins

The typical dry well is a prefabricated structure, such as an open-bottomed vault or box, placed in an excavation or boring. The vault may be empty, which provides maximum space efficiency, or may be filled in rock.

An infiltration basin has the same functional components—a volume to store runoff and sufficient area to infiltrate that volume into the native soil—but is open rather than covered.

► CRITERIA

Dry wells and infiltration basins must be designed with the minimum volume calculated by Equation 4-8 using a unit volume based on the County of San Diego's 85th Percentile Isopluvial Map.

Consult with the local jurisdiction engineer regarding the need to verify soil permeability and other site conditions are suitable for dry wells and infiltration basins. Some proposed criteria are on Page 5-12 of Caltrans' 2004 *BMP Retrofit Pilot Study Final Report* (CTSW-RT-01-050).

The infiltration rate and infiltrative area must be sufficient to drain a full facility within 72 hours.

► DETAILS

Dry wells should be sited to allow for the potential future need for removal and replacement.

In locations where native soils are coarser than a medium sand, the area directly beneath the facility should be over-excavated by two feet and backfilled with sand as a groundwater protection measure.

Best Uses

- Alternative to bioretention in areas with permeable soils

Advantages

- Compact footprint
- Can be installed in paved areas

Limitations

- Can be used only on sites with "A" and "B" soils
- Requires minimum of 10' from bottom of facility to seasonal high groundwater
- Not suitable for drainage from some industrial areas or arterial roads
- Must be maintained to prevent clogging.

Design Checklist for Dry Well

- ☐ Volume and infiltrative area meet or exceed minimum.
- ☐ Overflow connected to a downstream storm drain or approved discharge point.
- ☐ Emergency spillage will be safely conveyed overland.
- ☐ Depth from bottom of the facility to seasonally high groundwater elevation is $\geq 10'$.
- ☐ Areas tributary to the facility do not include automotive repair shops; car washes; fleet storage areas (Bus, truck, etc.); nurseries, or other uses that may present an exceptional threat to groundwater quality.
- ☐ Underlying soils are in Hydrologic Soil Group A or B. Infiltration rate is sufficient to ensure a full basin will drain completely within 72 hours. Soil infiltration rate has been confirmed.
- ☐ Set back from structures 10' or as recommended by structural or geotechnical engineer

Cistern with Bioretention Facility

A cistern in series with a bioretention facility can meet treatment requirements where space is limited. In this configuration, the cistern is equipped with a flow-control orifice and the bioretention facility is sized to treat a trickle outflow from the cistern.

► CRITERIA

Cistern. The cistern must detain the volume calculated by Equation 4-8 and must include an orifice or other device designed for a 24-hour drawdown time.

Bioretention facility. See the design sheet for bioretention facilities. The area of the bioretention facility must be sized to treat the maximum discharge flow, assuming a percolation rate of 5" per hour through the engineered soil.

Use with sand filter. A cistern in series with a sand filter can meet treatment requirements. See the discussion of treatment facility selection in Section 2 and the design guidance for sand filters in Section 4.

► DETAILS

Flow-control orifice. The cistern must be equipped with an orifice plate or other device to limit flow to the bioretention area.

Preventing mosquito harborage. Cisterns should be designed to drain completely, leaving no standing water. Drains should be located flush with the bottom of the cistern. Alternatively—or in addition—all entry and exit points, should be provided with traps or sealed or screened to prevent mosquito entry. Note mosquitoes can enter through openings $\frac{1}{16}$ " or larger and will fly for many feet through pipes as small as $\frac{1}{4}$ ".

Exclude debris. Provide leaf guards and/or screens to prevent debris from accumulating in the cistern.

Ensure access for maintenance. Design the cistern to allow for cleanout. Avoid creating the need for maintenance workers to enter a confined space. Ensure the outlet orifice can be easily accessed for cleaning and maintenance.

Best Uses

- In series with a bioretention facility to meet treatment requirement in limited space.
- Management of roof runoff
- Dense urban areas

Advantages

- Storage volume can be in any configuration

Limitations

- Somewhat complex to design, build, and operate
- Requires head for both cistern and bioretention facility

► APPLICATIONS

Shallow ponding on a flat roof. The “cistern” storage volume can be designed in any configuration, including simply storing rainfall on the roof where it falls and draining it away slowly. See the County of San Diego’s 85th percentile isopluvial diagrams for required average depths.

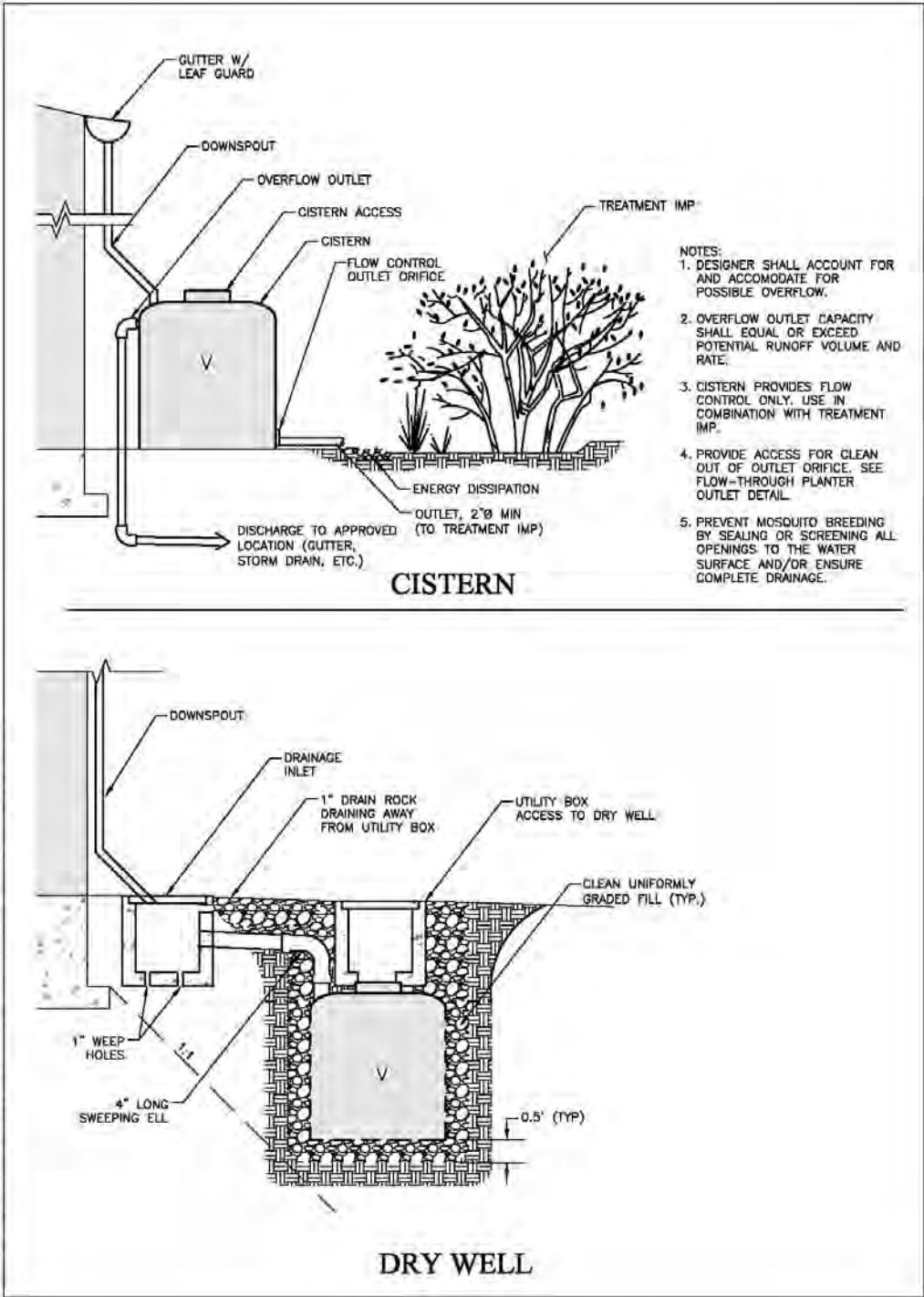
Cistern attached to a building and draining to a planter. This arrangement allows a planter box to be constructed with a smaller area.

Vault with pumped discharge to bioretention facility. In this arrangement, runoff from a parking lot and/or building roofs can be captured and detained underground and then pumped to a bioretention facility on the surface. Alternatively, treatment can be accomplished with a sand filter. See the discussion of selection of stormwater treatment facilities in Section 2.

Water harvesting or graywater reuse. It may be possible to create a site-specific design that uses cisterns to achieve stormwater flow control, stormwater treatment, and rainwater reuse for irrigation or indoor uses (**water harvesting**). Facilities must meet criteria for capturing and treating the volume specified by Equation 4-8. This volume must be allowed to empty within 24 hours so runoff from additional storms, which may follow, is also captured and treated. Additional volume may be required if the system also stores runoff for longer periods for reuse. Indoor uses of non-potable water may be restricted or prohibited. Check with municipal staff.

Design Checklist for Cistern

- ☐ Volume meets or exceeds minimum.
- ☐ Outlet with orifice or other flow-control device restricts flow and is designed to provide a 24-hour drawdown time.
- ☐ Outlet is piped to a bioretention facility designed to treat the maximum discharge from the cistern orifice.
- ☐ Cistern is designed to drain completely and/or sealed to prevent mosquito harborage.
- ☐ Design provides for exclusion of debris and accessibility for maintenance.
- ☐ Overflow connected to a downstream storm drain or approved discharge point.
- ☐ Emergency spillage will be safely conveyed overland.



Operation & Maintenance of Stormwater Facilities

How to prepare a customized Stormwater Maintenance Plan for the treatment BMPs on your site.

The stormwater Municipal Permit requires each Copermittee to verify all treatment and flow-control facilities are adequately maintained. Facilities you install as part of your project will be verified for effectiveness and proper performance.

Operation and maintenance of stormwater facilities is a six-stage process:

1. Determine **who will own** the facility and be responsible for the maintenance of treatment facilities. Identify the means by which ongoing maintenance will be assured (for example, a Permanent Stormwater Quality BMP Maintenance Agreement that runs with the land).
2. Identify anticipated maintenance requirements, and allow for these requirements in your project planning and preliminary design.
3. Prepare a **maintenance plan** for the site incorporating detailed requirements for **each treatment and flow-control facility**.
4. **Maintain** the facilities from the time they are constructed until ownership and maintenance responsibility is formally transferred.
5. **Formally transfer** operation and maintenance **responsibility** to the site owner or occupant.
6. Maintain the facilities in perpetuity and keep records for self-inspection, reporting, and verification requirements.

See the schedule for these stages in Table 5-1.

Stage 1: Ownership and Responsibility

You must specify a means to **ensure maintenance** of treatment and flow-control facilities **in perpetuity**.

Depending on the intended use of your site, you may be required by the city to do one or more of the following:

- Execution of a Permanent Stormwater Quality BMP Maintenance Agreement that “runs with the land.”
- Creation of a homeowners association (HOA) and execution of an agreement by the HOA to maintain the facilities as well as an annual inspection fee.
- Formation of a financing mechanism that addresses long-term maintenance/replacement of treatment and flow-control facilities.
- Dedication of public easements transferring maintenance responsibility of the facility to the city (for public facilities).

Ownership and maintenance responsibility for treatment and flow-control facilities should be discussed at the **beginning of project planning**, typically at the pre-application meeting for planning and zoning review. Experience has shown provisions to finance and implement maintenance of treatment and flow-control facilities can be a major stumbling block to project approval, particularly for **small residential subdivisions**. (See “New Subdivisions” in Section 1.)

► PRIVATE OWNERSHIP AND MAINTENANCE

For PDP projects, the owner will be required to execute a Permanent Stormwater Quality BMP Maintenance Agreement.

TABLE 5-1. SCHEDULE for planning operation and maintenance of stormwater treatment BMPs

<i>Stage</i>	<i>Description</i>	<i>Schedule</i>
1	Determine facility ownership and maintenance responsibility	Discuss with planning staff at pre-application meeting
2	Identify typical maintenance requirements	In initial submittal, coordinate with land-use application
3	Develop detailed operation and maintenance plan	Prior to plan check submittal
4	Interim operation and maintenance of facilities	During and following construction including warranty period
5	Formal transfer of operation & maintenance responsibility	On sale and transfer of property or permanent occupancy
6	Ongoing maintenance and compliance with inspection & reporting requirements	In perpetuity

In addition, the Permanent Stormwater Quality BMP Maintenance Agreement may provide that, if the property owner fails to maintain the stormwater facility, the city may enter the property, restore the stormwater facility to good working order and obtain reimbursement, including administrative costs, from the property owner.

► TRANSFER TO PUBLIC OWNERSHIP

For city facilities, the City may have treatment and flow-control facility granted within an easement to maintain the facility as part of the municipal storm drain system. The City may recoup the costs of maintenance through a special tax, assessment district, or similar mechanism.

In general, private treatment and flow-control facilities in the City right-of-way require the processing and recording of an Encroachment Agreement against the property to assure ongoing maintenance of the BMP, TCBMP, IMP or flow-control facility.

Locating a TCBMP/IMP in a public right-of-way or easement creates an additional design constraint—along with hydraulic grade, aesthetics, landscaping, and circulation. However, because sites typically drain to the street, it may be possible to locate a bioretention swale parallel with the edge of the parcel. The facility may complement, or substitute for an underground storm drain system, subject to city approval.

Even if the facility is to be conveyed to the city after construction is complete, it is still the responsibility of the applicant to identify general operation and maintenance requirements, prepare a detailed operation and maintenance plan, and to maintain the facility until that responsibility is formally transferred.

Stage 2: General Maintenance Requirements

Include in your SWMP a general description of anticipated facility maintenance requirements. This will help ensure that:

- Ongoing costs of maintenance have been considered in your facility selection and design.
- Site and landscaping plans provide for access for inspections and by maintenance equipment.
- Landscaping plans incorporate irrigation requirements for facility plantings.
- Initial maintenance and replacement of facility plantings is incorporated into landscaping contracts and guarantees.

Fact sheets available on the Project Clean Water web page describe general maintenance requirements for the types of stormwater facilities featured in the LID Design Guide (Section 4). You can use this information to specify general maintenance requirements in your SWMP.

Maintenance fact sheets for conventional stormwater facilities are available in the California Stormwater BMP Handbooks.

Stage 3: Detailed Maintenance Plan

Include a detailed maintenance plan with the initial SWMP (see SWMP requirements checklist).

Your detailed maintenance plan should be kept on-site for use by maintenance personnel and during site inspections. It is also recommended that a copy of your city-approved SWMP be kept onsite as a reference.

► YOUR DETAILED MAINTENANCE PLAN: STEP BY STEP

The following step-by-step guidance will help you prepare your detailed maintenance plan.

Preparation of the plan will require familiarity with your stormwater facilities as they have been or will be constructed and a fair amount of “thinking through” plans for their operation and maintenance.

► STEP 1: DESIGNATE RESPONSIBLE INDIVIDUALS

To begin creating your detailed maintenance plan, designate and identify:

- The individual who will have direct responsibility for the maintenance of stormwater controls. This individual should be the designated contact with city stormwater staff and should sign self-inspection reports and any correspondence with the city regarding verification inspections.
- Employees or contractors who will report to the designated contact and are responsible for carrying out BMP operation and maintenance.
- The corporate officer authorized to negotiate and execute any contracts that might be necessary for future changes to operation and maintenance or to implement remedial measures if problems occur.
- Your designated respondent to problems, such as clogged drains or broken irrigation lines, that would require immediate response should they occur during off-hours.

Updated contact information must be provided to the city immediately whenever a property is sold and whenever designated individuals or contractors change.

Draw or sketch an **organization chart** to show the relationships of authority and responsibility between the individuals responsible for maintenance. This need not be elaborate, particularly for smaller organizations.

Describe how **funding for BMP operation and maintenance** will be assured, including sources of funds, budget category for expenditures, process for establishing the annual maintenance

budget, and process for obtaining authority should unexpected expenditures for major corrective maintenance be required.

Describe how your organization will accommodate initial **training** of staff or contractors regarding the purpose, mode of operation, and maintenance requirements for the stormwater facilities on your site. Also, describe how your organization will ensure ongoing training as needed and in response to staff changes.

► **STEP 2: SUMMARIZE DRAINAGE AND BMPS**

Incorporate the following information from your SWMP into your maintenance plan:

- Figures delineating and designating pervious and impervious areas.
- Figures showing locations of stormwater facilities on the site.
- Tables of pervious and impervious areas served by each facility.

Review the SWMP narrative, if any, that describes each facility and its tributary drainage area and update the text to incorporate any changes that may have occurred during planning and zoning review, building permit review, or construction. Incorporate the updated text into your maintenance plan.

► **STEP 3: DOCUMENT FACILITIES “AS BUILT”**

Include the following information from final construction drawings:

- Plans, elevations, and details of all facilities. Annotate if necessary with designations used in the initial SWMP.
- Design information or calculations submitted in the detailed design phase (i.e., not included in the initial SWMP.)
- Specifications of construction for facilities, including sand or soil, compaction, pipe materials and bedding.

In the maintenance plan, note field changes to design drawings, including changes to any of the following:

- Location and layouts of inflow piping, flow splitter boxes, and piping to off-site discharge
- Depths and layering of soil, sand, or gravel
- Placement of filter fabric or geotextiles
- Changes or substitutions in soil or other materials.
- Natural soils encountered (e.g., sand or clay lenses)

► STEP 4: PREPARE MAINTENANCE PLANS FOR EACH FACILITY

Prepare a maintenance plan, schedule, and inspection checklists (routine, annual, and after major storms) for each facility. Plans and schedules for two or more similar facilities on the same site may be combined.

Use the following resources to prepare your customized maintenance plan, schedule, and checklists.

- Specific information noted in Steps 2 and 3, above.
- Other input from the facility designer, municipal staff, or other sources.
- Operation and Maintenance Fact Sheets (available on the Project Clean Water website).

Note any particular characteristics or circumstances that could require attention in the future, and include any troubleshooting advice.

Also include manufacturer's data, operating manuals, and maintenance requirements for any:

- Pumps or other mechanical equipment.
- Proprietary devices used as BMPs.

Manufacturers' publications should be referenced in the text (including models and serial numbers where available). Copies of the manufacturers' publications should be included as an attachment in the back of your maintenance plan or as a separate document.

► STEP 5: COMPILE MAINTENANCE PLAN

The following general outline is provided as an example.

- I. Inspection and Maintenance Log
- II. Updates, Revisions and Errata
- III. Introduction
 - A. Narrative overview describing the site; drainage areas, routing, and discharge points; and treatment facilities.
- IV. Responsibility for Maintenance
 - A. General
 - (1) Name and contact information for responsible individual(s).
 - (2) Organization chart or charts showing organization of the maintenance function and location within the overall organization.

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- (3) Reference to Operation and Maintenance Agreement (if any). A copy of the agreement should be attached.
 - (4) Maintenance Funding
 - (1) Sources of funds for maintenance
 - (2) Budget category or line item
 - (3) Description of procedure and process for ensuring adequate funding for maintenance
 - B. Staff Training Program
 - C. Records
 - D. Safety
- V. Summary of Drainage Areas and Stormwater Facilities
 - A. Drainage Areas
 - (1) Drawings showing pervious and impervious areas (copied or adapted from initial SWMP).
 - (2) Designation and description of each drainage area and how flow is routed to the corresponding facility.
 - B. Treatment and Flow-Control Facilities
 - (1) Drawings showing location and type of each facility
 - (2) General description of each facility (Consider a table if more than two facilities)
 - (1) Area drained and routing of discharge.
 - (2) Facility type and size
- VI. Facility Documentation
 - A. “As-built” drawings of each facility (design drawings in the draft Plan)
 - B. Manufacturer’s data, manuals, and maintenance requirements for pumps, mechanical or electrical equipment, and proprietary facilities (include a “placeholder” in the draft plan for information not yet available).
 - C. Specific operation and maintenance concerns and troubleshooting
- VII. Maintenance Schedule or Matrix
 - A. Maintenance Schedule for each facility with specific requirements for:

- (1) Routine inspection and maintenance
- (2) Annual inspection and maintenance
- (3) Inspection and maintenance after major storms

B. Service Agreement Information

Assemble and make copies of your maintenance plan. One copy must be submitted to the municipality, and at least one copy kept on-site. Here are some suggestions for formatting the maintenance plan:

- Format plans to 8½" x 11" to facilitate duplication, filing, and handling.
- Include the revision date in the footer on each page.
- Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed-up so that copies of the maintenance plan can be made if the hard copy is lost or damaged.

► STEP 6: UPDATES

Your maintenance plan will be **a living document**.

Operation and maintenance personnel may change; mechanical equipment may be replaced, and additional maintenance procedures may be needed. Throughout these changes, the maintenance plan must be kept up-to-date.

Updates may be transmitted to the local municipality at any time. However, at a minimum, updates to the maintenance plan must accompany the annual inspection report.

Stage 4: Interim Maintenance

Applicants will typically be required to warranty stormwater facilities against lack of performance due to flaws in design or construction. The warranty may need to be secured by a bond or other financial instrument.

Stage 5: Transfer Responsibility

As part of the detailed maintenance plan, note the expected date when responsibility for operation and maintenance will be transferred. Notify the municipality when this transfer of responsibility takes place.

Stage 6: Operation & Maintenance Verification

Each municipality implements an operation and maintenance verification program, including periodic site inspections.

Contact municipal staff to determine the frequency of inspections, whether self-inspections are allowed, and applicable fees, if any.

References and Resources

- *Urban Runoff Quality Management* (WEF/ASCE, 1998). pp 186-189.
- *Stormwater Management Manual* (Portland, 2004). Section 3.
- *California Storm Water Best Management Practice Handbooks* (CASQA, 2003).
- *Best Management Practices Guide* (Public Telecommunications Center for [Hampton Roads](#), 2002).
- Operation, Maintenance, and Management of Stormwater Management Systems (Watershed Management Institute, 1997)

SECTION 5: STORMWATER FACILITY MAINTENANCE

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Glossary

Applicant	Project proponent responsible for processing and ensuring a project is consistent with regulatory codes, standards, policies and procedures. This may be the property owner, developer or agent for the property owner.
Best Management Practice (BMP)	Any procedure or device designed to minimize the quantity of pollutants that enter the storm drain system.
California Association of Stormwater Quality Agencies (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com . Successor to the Storm Water Quality Task Force (SWQTF).
California BMP Method	A method for determining the required volume of stormwater treatment facilities. Described in Section 5.5.1 of the California Stormwater Best Management Practice Manual (New Development) (CASQA, 2003).
City	City of Carlsbad
Conditions of Approval (COAs)	Requirements the city may adopt for a project in connection with a discretionary action (e.g., tract map, planned unit development, coastal development permit, adoption of an EIR or negative declaration conditional use permit, etc.). COAs may include features to be incorporated into the final plans for the project and may also specify uses, activities, and operational measures that must be observed over the life of the project.
Continuous Simulation Modeling	A method of hydrological analysis in which a set of rainfall data (typically hourly for 30 years or more) is used as input, and runoff rates are calculated on the same time step. The output is then analyzed statistically for the purposes of comparing runoff patterns under different conditions (for example, pre- and post-development-project).
Copermittees	See Dischargers .
Detention	The practice of holding stormwater runoff in ponds, vaults, within berms, or in depressed areas and letting it discharge slowly to the storm drain system. See definitions of infiltration and retention .
Directly Connected Impervious Area	Any impervious surface which drains into a catch basin, area drain, or other conveyance structure without first allowing flow across pervious areas (e.g. lawns).
Direct Infiltration	Infiltration via methods or devices, such as pervious pavement, dry wells or infiltration trenches, designed to bypass unsaturated surface soils and transmit runoff directly to groundwater.
Dischargers	The agencies named in the Municipal Permit (see definition): the County of San Diego; the Cities of Carlsbad, El Cajon, La Mesa, Poway, Solana Beach, Chula Vista, Encinitas, Lemon Grove, San Diego, Vista, Coronado, Escondido, National City, San Marcos, Del Mar, Imperial Beach, Oceanside, and Santee; the San Diego Unified Port District, and the San Diego County Regional Airport Authority.

Drainage Management Areas	Areas delineated on a map of the development site showing how drainage is detained, dispersed, or directed to Integrated Management Practices . There are four types of Drainage Management Areas, and specific criteria apply to each type of area. See Section 4.
Drawdown time	The time required for a stormwater detention or infiltration facility to drain and return to the dry-weather condition. For detention facilities, drawdown time is a function of basin volume and outlet orifice size. For infiltration facilities, drawdown time is a function of basin volume and infiltration rate.
Environmentally Sensitive Areas (ESA)	Areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); water bodies designated with the RARE beneficial use by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); areas designated as preserves or their equivalent under the Multi Species Conservation Program within the Cities and County of San Diego; and any other equivalent environmentally sensitive areas which have been identified by the city (e.g.: Habitat Management Plan).
Flow Control	Control of runoff rates and durations as required by the Hydromodification Management Plan (HMP).
Head	In hydraulics, energy represented as a difference in elevation. In slow-flowing open systems, the difference in water surface elevation, e.g., between an inlet and outlet.
Higher-Rate Biofilter	A biofilter with a design surface loading rate higher than the 5 inches per hour rate specified in this document for bioretention facilities and planter boxes.
Hydrograph	Runoff flow rate plotted as a function of time.
Hydromodification Management Plan (HMP)	A technical approach and process to ensure that post-project runoff shall not exceed estimated pre-project rates and/or durations, where increased runoff would result in increased potential for erosion or other adverse impacts to beneficial uses. Also see definition for flow control. Refer to approved HMP on http://www.projectcleanwater.org .
Hydrologic Soil Group	Classification of soils by the Natural Resources Conservation Service (NRCS) into A, B, C, and D groups according to infiltration capacity.
Impervious surface	Any material that prevents or substantially reduces infiltration of water into the soil. See discussion of imperviousness in Section 2.
Infeasible	As applied to best management practices, impossible to implement because of technical or physical constraints specific to the site.
Infiltration	Seepage of runoff into soils underlying the site. See definition of retention .
Infiltration Device	Any structure, such as pervious pavement, or a dry well, that is designed to infiltrate stormwater into the subsurface and, as designed, bypasses the natural groundwater protection afforded by surface or near-surface soil. See definition for direct infiltration .

Integrated Management Practice (IMP)	A facility (BMP) that provides small-scale treatment, retention, and/or detention and is integrated into site layout, landscaping and drainage design. If using the sizing factors per the HMP (and not the water quality-only factors) an IMP sized per Section 4 will satisfy LID, treatment control and flow-control (hydromodification) requirements per the Municipal Permit. See Low Impact Development .
Integrated Pest Management (IPM)	An approach to pest management that relies on information about the life cycles of pests and their interaction with the environment. Pest control methods are applied with the most economical means and with the least possible hazard to people, property, and the environment.
Interim Hydromodification Criteria	Pursuant to Provision D.1.d.g.(6) of the Municipal Permit, the Copermittees prepared Interim Hydromodification Management criteria, which apply to projects disturbing 50 acres or more. The criteria are described in Section 2 and in memoranda on the Project Clean Water website.
Jurisdictional Urban Runoff Management Plan (JURMP)	A written description of the specific jurisdictional urban runoff management measures and programs that each Copermittee implements to comply with the Municipal Permit and ensure pollutant discharges are reduced to the MEP and do not cause or contribute to a violation of water quality standards. See Stormwater Pollution Prevention Program .
Lead Agency	The public agency that has the principal responsibility for carrying out or approving a project. (CEQA Guidelines §15367).
Low Impact Development	Refers to a variety of site design techniques and post-development Best Management Practices that can be employed on projects that reduce pollutant runoff from development and methods that encourage percolation and evapo-transpiration. Also refers to an integrated site design methodology (see Section 4) that uses small-scale detention and retention (Integrated Management Practices, or IMPs) to mimic pre-existing site hydrological conditions.
Maximum Extent Practicable (MEP)	Standard, established by the 1987 amendments to the Clean Water Act, for the implementation of municipal stormwater pollution prevention programs (see definition). According to the Act, municipal stormwater NPDES permits “shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants.”
Municipal Permit	Unless otherwise stated, represents the most recent NPDES permit issued by a Regional Water Quality Control Board (see definition) to local government agencies (Dischargers) placing provisions on allowable discharges of municipal stormwater to waters of the state.
National Pollutant Discharge Elimination System (NPDES)	As part of the 1972 Clean Water Act, Congress established the NPDES permitting system to regulate the discharge of pollutants from municipal sanitary sewers and industries. The NPDES was expanded in 1987 to incorporate permits for stormwater discharges as well.
Numeric Criteria	Sizing requirements for stormwater treatment facilities established in Provision D.1.d.(6)(c) of the Municipal Permit issued by the San Diego RWQCB.

Operation and Maintenance (O&M)	Refers to requirements outlined in the Municipal Permit to inspect treatment BMPs and implement preventative and corrective maintenance in perpetuity. See Section 5.
Parking Lot	A land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.
Permeable Pavements	Pavements for roadways, sidewalks, or plazas that are designed to infiltrate a portion of rainfall, including pervious concrete, pervious asphalt, unit-pavers-on-sand, and crushed gravel.
Priority Development Project (PDP)	A project that, based on the outcome of a completed Stormwater Standards Questionnaire (SWSQ) and matching criteria of Provision D.1.d.(1) of the Municipal Permit , is subject to Priority Development Project requirements that must satisfy the additional storm water requirements per this SUSMP.
Priority Development Project (PDP) Requirements	Additional storm water requirements as described in this SUSMP that apply to PDP's. Require the preparation of a Storm Water Management Plan, See Section 1 for more information.
Project Area	The entire project area comprises all areas to be altered or developed by the project, plus any additional areas that drain on to areas to be altered or developed.
Proprietary	A proprietary device is one marketed under legal right of the manufacturer.
Redevelopment	<p>The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces.</p> <p>Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing and reconfiguring surface parking lots and existing roadways; new sidewalk construction, pedestrian ramps, or bikelane on existing roads; and routine replacement of damaged pavement, such as pothole repair.</p>
Rational Method	A method of calculating runoff flows based on rainfall intensity, tributary area, and a factor representing the proportion of rainfall that runs off.
Regional (or Watershed) Stormwater Treatment Facility	A facility that treats runoff from more than one project or separately-owned parcel/lot/unit. These trigger shared-maintenance responsibilities.
Regional Water Quality Control Board (Regional Water Board or RWQCB)	California RWQCBs are responsible for implementing pollution control provisions of the Clean Water Act and California Water Code within their jurisdiction. There are nine California RWQCBs.
Retention	The practice of holding stormwater in ponds or basins, or within berms or depressed areas, and allowing it to slowly infiltrate into underlying soils. Some portion will evaporate. See definitions for infiltration and detention .

Self-retaining area	An area designed to retain runoff. Self-retaining areas may include graded depressions with landscaping or pervious pavements and may also include tributary impervious areas up to a 2:1 impervious-to-pervious ratio. These require demonstration of soil parameters with percolation rates and adequate drawdown times.
Self-treating area	A natural, landscaped, or turf area drains directly off site or to the public storm drain system.
Single-sheet post construction BMP exhibit	A comprehensive post-construction exhibit prepared as part of a Storm Water Management Plan (SWMP). Refer to guidelines in Section 3 and SWMP checklists on the city's website at www.carlsbadca.gov/forms .
Source Control	Land use or site planning practices, or structural or nonstructural measures that aim to prevent urban runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between pollutants and urban runoff.
Standard Industrial Classification (SIC)	A Federal government system for classifying industries by 4-digit code. It is being supplanted by the North American Industrial Classification System but SIC codes are still referenced by the Regional Water Board in identifying development sites subject to regulation under the Municipal Permit. Information and an SIC search function are available at http://www.bls.gov/bls/NAICS.htm
Storm Water Pollution Prevention Plan (SWPPP)	A plan providing for temporary measures to control sediment and other pollutants during construction as required by the most recent statewide permit regulating construction activities.
Stormwater Pollution Prevention Program	A comprehensive program of activities designed to minimize the quantity of pollutants entering storm drains. See Jurisdictional Urban Runoff Management Plan .
Standard Stormwater Requirements	New or redevelopment projects that are not subject to Priority Development Projects requirements are, by default, subject to Standard Storm Water Requirements. Standard Storm Water Requirements involve incorporating LID site design techniques and source control BMP's. As examples, this can be done by discharging runoff from impervious surfaces over landscaping, minimizing impervious surfaces, covering trash receptacles, and implementing construction BMP's. See Section 2.
Standard Urban Stormwater Mitigation Plan (SUSMP)	Refers to this local document prepared in connection with implementation of the stormwater Municipal Permit mandate to control pollutants from new development and redevelopment projects. Applicants for development project approvals will use this SUSMP to evaluate their stormwater project requirements which may include the preparation of a Stormwater Management Plan (SWMP) if described as a project subject to Priority Development Project requirements .
Storm Water Management Plan (SWMP)	Refers to a technical document prepared by the Applicant, for project subject to Priority Development Project requirements , demonstrating how the project satisfies the additional stormwater requirements of the SUSMP. The SWMP is subject to review and approval by the city. The SWMP is same document commonly referred to in the Municipal Permit as the Water Quality Technical Report. See Section 3 and the SWMP requirements checklist on the city website.

**Storm Water Standards
Questionnaire (SWSQ)**

Document that is filled out by Applicant to help determine the type of stormwater requirements that apply to a project. City also review this form to verify accuracy and outcome. See the city Web site (form E-34) at <http://www.carlsbadca.gov/development-forms>.

SUSMP Drawings

Depending on the storm water requirements your project is subject to and the type of permits your project requires, SUSMP Drawings could consist of Discretionary Site Plans, Building Site Plans, Grading/Improvement Plans, and/or the single-sheet post-construction BMP Plan attached as part of the SWMP for your project.

Treatment

Removal of pollutants from runoff, typically by filtration or settling.

**Treatment Control Best
Management Practice
(TCBMP)**

A facility (**BMP**) that provides treatment control and is integrated into site layout, landscaping and drainage design. Depending on the chosen facility it may satisfy low impact development techniques requirements. Using the sizing factors for “water quality-only” per Section 4 or flow-based or volume-based (per the Municipal Permit) a correctly selected and sized TCBMP will satisfy the treatment control requirements per the Municipal Permit.

Water Board

See **Regional Water Quality Control Board**.

**Water Quality Volume
(WQV)**

For stormwater treatment facilities that depend on detention to work, the volume of water that must be detained to achieve maximum extent practicable pollutant removal. This volume of water must be detained for a specified **drawdown time**.

**Water Quality Technical
Report (WQTR)**

Refer to **Storm Water Management Plan**.

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Appendix 1

Stormwater Pollutant Sources and Source Control Checklist

How to Use this Checklist:

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your project. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your SUSMP Drawings.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in a table in your SUSMP Drawings. For PDP's, in your SWMP, use the format shown in Table 3-1. In the SWMP, describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternatives.

IF THESE SOURCES WILL BE ON THE PROJECT SITE THEN YOUR PROJECT SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on SUSMP Drawings	3 Permanent Controls—List in SWMP Table and Narrative	4 Operational BMPs—Include in SWMP Table and Narrative
<input type="checkbox"/> A. On-site storm drain inlets	<input type="checkbox"/> Locations of inlets.	<input type="checkbox"/> Mark all inlets with the words “No Dumping! Flows to Bay” or similar.	<input type="checkbox"/> Maintain and periodically repaint or replace inlet markings. <input type="checkbox"/> Provide stormwater pollution prevention information to new site owners, lessees, or operators. <input type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com <input type="checkbox"/> Include the following in lease agreements: “Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains.”

<input type="checkbox"/> B. Interior floor drains and elevator shaft sump pumps		<input type="checkbox"/> State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	<input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.
<input type="checkbox"/> C. Interior parking garages		<input type="checkbox"/> State that parking garage floor drains will be plumbed to the sanitary sewer.	<input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.
<input type="checkbox"/> D1. Need for future indoor & structural pest control		<input type="checkbox"/> Note building design features that discourage entry of pests.	<input type="checkbox"/> Provide Integrated Pest Management information to owners, lessees, and operators.
<input type="checkbox"/> D2. Landscape/ Outdoor Pesticide Use	<input type="checkbox"/> Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. <input type="checkbox"/> Show self-retaining landscape areas, if any. <input type="checkbox"/> If a PDP, show stormwater treatment facilities.	<p>State that final landscape plans will accomplish all of the following.</p> <input type="checkbox"/> Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. <input type="checkbox"/> Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. <input type="checkbox"/> Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. <input type="checkbox"/> Consider using pest-resistant plants, especially adjacent to hardscape. <input type="checkbox"/> To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	<input type="checkbox"/> Maintain landscaping using minimum or no pesticides. <input type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com <input type="checkbox"/> Provide IPM information to new owners, lessees and operators.
<input type="checkbox"/> E. Pools, spas, ponds, decorative fountains, and other water features.	<input type="checkbox"/> Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	<input type="checkbox"/> If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	<input type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

<input type="checkbox"/> F. Food service	<input type="checkbox"/> For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. <input type="checkbox"/> On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	<input type="checkbox"/> Describe the location and features of the designated cleaning area. <input type="checkbox"/> Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	<input type="checkbox"/>
<input type="checkbox"/> G. Refuse areas	<input type="checkbox"/> Show where site refuse and recycled materials will be handled and stored for pickup. See city standard drawing GS-16. <input type="checkbox"/> If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. <input type="checkbox"/> Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	<input type="checkbox"/> State how site refuse will be handled and provide supporting detail to what is shown on plans. <input type="checkbox"/> State that signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	<input type="checkbox"/> State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post “no hazardous materials” signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, “Waste Handling and Disposal” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<input type="checkbox"/> H. Industrial processes.	<input type="checkbox"/> Show process area.	<input type="checkbox"/> If industrial processes are to be located on site, state: “All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.”	<input type="checkbox"/> See Fact Sheet SC-10, “Non-Stormwater Discharges” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

<p><input type="checkbox"/> I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)</p>	<p><input type="checkbox"/> Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.</p> <p><input type="checkbox"/> Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.</p> <p><input type="checkbox"/> Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.</p>	<p><input type="checkbox"/> Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.</p> <p>Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for:</p> <ul style="list-style-type: none"> ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank 	<p><input type="checkbox"/> See the Fact Sheets SC-31, “Outdoor Liquid Container Storage” and SC-33, “Outdoor Storage of Raw Materials ” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com</p>
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<p><input type="checkbox"/> J. Vehicle and Equipment Cleaning</p>	<p><input type="checkbox"/> Show on drawings as appropriate:</p> <p>(1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.</p> <p>(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).</p> <p>(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.</p> <p>(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.</p>	<p><input type="checkbox"/> If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced.</p>	<p>Describe operational measures to implement the following (if applicable):</p> <p><input type="checkbox"/> Wastewater from vehicle and equipment washing operations shall not be discharged to the storm drain system.</p> <p><input type="checkbox"/> Car dealerships and similar may rinse cars with water only.</p> <p><input type="checkbox"/> See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com</p>
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<input type="checkbox"/> K. Vehicle/Equipment Repair and Maintenance	<input type="checkbox"/> Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. <input type="checkbox"/> Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. <input type="checkbox"/> Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	<input type="checkbox"/> State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. <input type="checkbox"/> State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. <input type="checkbox"/> State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	<p>In the SUSMP report, note that all of the following restrictions apply to use the site:</p> <input type="checkbox"/> No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. <p>No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.</p> <p>No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.</p> <input type="checkbox"/>
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<p><input type="checkbox"/> L. Fuel Dispensing Areas</p>	<p><input type="checkbox"/> Fueling areas¹ shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.</p> <p><input type="checkbox"/> Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area¹.] The canopy [or cover] shall not drain onto the fueling area.</p>		<p><input type="checkbox"/> The property owner shall dry sweep the fueling area routinely.</p> <p><input type="checkbox"/> See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com</p>
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¹ The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

<input type="checkbox"/> M. Loading Docks	<input type="checkbox"/> Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. <input type="checkbox"/> Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. <input type="checkbox"/> Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		<input type="checkbox"/> Move loaded and unloaded items indoors as soon as possible. <input type="checkbox"/> See Fact Sheet SC-30, “Outdoor Loading and Unloading,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<input type="checkbox"/> N. Fire Sprinkler Test Water		<input type="checkbox"/> Provide a means to drain fire sprinkler test water to the sanitary sewer.	<input type="checkbox"/> See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

<p>O. Miscellaneous Drain or Wash Water</p> <ul style="list-style-type: none"> <input type="checkbox"/> Boiler drain lines <input type="checkbox"/> Condensate drain lines <input type="checkbox"/> Rooftop equipment <input type="checkbox"/> Drainage sumps <input type="checkbox"/> Roofing, gutters, and trim. 		<ul style="list-style-type: none"> <input type="checkbox"/> Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. <input type="checkbox"/> Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. <input type="checkbox"/> Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. <input type="checkbox"/> Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. <input type="checkbox"/> 	
<ul style="list-style-type: none"> <input type="checkbox"/> P. Plazas, sidewalks, and parking lots. 			<ul style="list-style-type: none"> <input type="checkbox"/> Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

Chapter 3

Construction SWPPP Standards and Requirements

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3.1 Construction SWPPP Standards Introduction

3.1.1 Background Information

The Construction Storm Water Pollution Prevention Plan (SWPPP) standards and requirements described herein were established to ensure construction compliance with the City of Carlsbad Storm Water Ordinance and the Municipal Permit, as issued by the Regional Water Quality Control Board for the San Diego Region (see below for Municipal Permit reference details). This chapter must be used in conjunction with other chapters of this manual to ensure full compliance with both construction and post construction storm water requirements. This chapter addresses the need for temporary Best Management Practices (BMPs) during construction activities to minimize the mobilization of pollutants such as sediment and to minimize the exposure of storm water to pollutants.

Pursuant to Titles 11, 15 and 18 of the Carlsbad Municipal Code, all construction activities within the City, whether the City issues a construction permit or not, are subject to the provisions of the standards and requirements of this manual.

The water quality protection measures and construction procedures described in this chapter of the manual are intended to ensure construction activity compliance with the following State and Regional water quality permits:

Municipal Permit -more particularly described as San Diego California Regional Water Quality Control Board San Diego Region Order No. R9-2007-01, NPDES No. CAS0108758 Waste Discharge Requirements for Discharges of Urban Runoff from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds of the County of San Diego County, the San Diego Unified Port District, and the San Diego County Regional Airport Authority and any amendment, revision or re-issuance thereof; and,

General Construction Permit - more particularly described as NPDES General Permit for Storm Water Discharges Associated with Construction Activity, Water Quality Order No. 99-08-DWQ, NPDES No. CAS000002, issued by the State Water Resources Control Board (Construction General Permit), and any amendment, revision or re-issuance thereof; and,

General Linear Utility Permit - more particularly described as NPDES General Permit for Storm Water Discharges Associated with Construction Activity from Small Linear Underground/Overhead Projects, Water Quality Order 2003-0007 – DWQ issued by the State Water Resources Control Board, and any amendment, revision or re-issuance thereof.

3.1.2 Standards Applicability to Construction Projects

All construction activities in the City of Carlsbad are subject to the requirements of the Municipal Permit. Construction activities that meet one or more of the following criteria are additionally subject to the requirements of the General Construction Permit.

Construction activities that:

- 1) Disturb one or more acres of land area;
- 2) Form part of a larger common plan of development that encompasses one or more acres of soil disturbance; or
- 3) Have the potential for significant water quality impairment.

The General Construction Permit does not apply to routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of an existing facility, nor does it include emergency construction activities required to protect public health and safety. Developers/owners/contractors should confirm with the San Diego Regional Water Quality Control Board (SDRWQCB) staff whether or not a particular routine maintenance activity is subject to the General Construction Permit.

Construction of small linear utility facility projects that are not subject to the General Construction Permit are subject to the requirements of the General Linear Utility Permit. This includes but is not limited to construction of any conveyance pipe for transportation of gaseous, liquid, liquescent or slurry material; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications; and, associated ancillary facilities. Developers/owners/contractors should confirm with the SDRWQCB staff whether or not a particular underground or overhead utility construction project is subject to the General Linear Utility Permit.

3.2 Construction SWPPP Requirements and Approval Process

3.2.1 Construction SWPPP Tier Levels

Every construction activity within the City that has the potential to negatively affect water quality must prepare a construction storm water pollution prevention plan (Construction SWPPP) whether or not the City issues a construction permit for the activity. To ensure compliance with all the various State and Regional permitting regulations, the City established a three-tiered system for the preparation of Construction SWPPPs. The tiers range from Tier 3 representing the highest threat to water quality to Tier 1 representing the lowest threat to water quality. The threshold triggers for each of the three tier levels are generally described below together with a reference to the applicable Construction SWPPP standards.

Tier 3 - Construction activities that impact one or more acres (individually or cumulatively through phased construction) or that, regardless of size, pose a significant potential for storm water quality impairment must prepare a Tier 3 Construction SWPPP in conformance with the standards and requirements of the Construction General Permit and City Standards.

Tier 2 – Construction activities that impact less than one acre and that pose a moderate threat to storm water quality must prepare a Tier 2 Construction SWPPP in conformance with City Standards. In the case of small linear underground/overhead utility projects, the project must also demonstrate compliance with the General Linear Utility Permit.

Tier 1 – Construction activities that impact less than one acre and pose a low threat to storm water quality must prepare a Tier 1 Construction SWPPP in conformance with City Standards. In the case of small linear underground/overhead utility projects, the project must also demonstrate compliance with the General Linear Utility Permit.

Exempt - Construction activities that pose no threat to storm water quality are exempt from the preparation of a Construction SWPPP; however, the construction activities must still comply with all construction BMPs required pursuant to Title 15 of the CMC and these standards.

3.2.2 Determination of Construction SWPPP Tier Level

The worksheet entitled “Project Threat Assessment Worksheet for Determination of Construction SWPPP Tier Level”, attached as Appendix A, shall be used to determine the appropriate tier level of Construction SWPPP for a proposed construction project. The worksheet is also used to determine whether the project is exempt from Construction SWPPP requirements. The completed worksheet shall be submitted with applications for each construction permit submitted to the City including building permits, grading permits and right-of-way permits.

To make a determination, the project reviewer starts with the assessment criteria located at the top of the worksheet along the left hand column and works downward through the various threat categories and assessment criteria. At the first point where the proposed project makes a match with the assessment criteria, a check is made in the box next to the criteria. The tier level listed in the right hand column in the same row as the selected assessment criteria is the required Construction SWPPP Tier Level for the project.

If none of the boxes in the Significant, Moderate or Low Threat Project Assessment Criteria categories are checked, then the project is exempt from the Construction SWPPP requirements. Proposed construction projects may be considered categorically exempt from the Construction SWPPP requirements when, and if, the project only requires issuance of one or more of the construction permit types shown on Table 1 below.

Exempt projects must still comply with all storm water best management practices pursuant to Title 15 of the Carlsbad Municipal Code and City Standards. If in the opinion of the City Engineer, an otherwise exempt project is, or potentially could pose, a threat to storm water quality, the City Engineer may require preparation and implementation of a Construction SWPPP at a tier level commensurate with the storm water threat

Table 1	
City Construction Permit Types Exempt from Construction SWPPP Requirements	
Electrical Permit Fire Additional Permit Fire Alarm Permit Fixed Systems Permit Mechanical Permit Mobile Home Permit Re-Roofing Permit	Patio Deck Plumbing Permit Sign Permit Spa – Factory Made Sprinkler Permit Water Discharge Permit

Cautionary Note - The Project Threat Assessment Worksheet represents the project proponent's assessment of the threat posed by a proposed construction project. City staff has responsibility for making the final assessment regarding the need for and tier level of Construction SWPPP required. The City staff decision is made after submission of the plan review application. A staff determination that the construction plan review application is subject to the preparation of a Construction SWPPP, or is subject to more stringent Construction SWPPP requirement than initially assessed by the applicant (project proponent), will result in the return of the plan review application as incomplete.

If applicants are unsure about the meaning of any of the assessment criteria described in the worksheet or need help in determining how to respond to one or more of the assessment criteria, they are strongly encouraged to seek assistance from Engineering Department Development Services staff prior to preparation of the Construction SWPPP and submission for construction plan review.

3.2.3 Qualified Persons to Prepare a Construction SWPPP

The project proponent is responsible for preparing the appropriate tier level Construction SWPPP. Tier 2 and Tier 3 Construction SWPPPs shall be prepared in accordance with the requirements of this manual. All Tier 2 and Tier 3 Construction SWPPPs shall be written, amended and certified by a Qualified SWPPP Preparer.

A Qualified SWPPP Preparer shall have one of the following registrations or certifications:

1. A California registered civil engineer,
2. A California registered geologist,
3. A California registered landscape architect,
4. A professional hydrologist registered through the American Institute of Hydrology,
5. A certified professional soil scientist registered through the Soil Science Society of America,
6. A certified professional in erosion and sediment control registered through Certified Professional in Erosion and Sediment Control, Inc.,
7. A certified professional in storm water quality registered through Certified Professional in Erosion and Sediment Control, Inc., or
8. A certified professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies.

Any hydrology or hydraulic calculations, soils reports or geotechnical reports prepared in support of a Tier 2 or Tier 3 Construction SWPPP must be prepared by a professional engineer with appropriate registration qualifications issued by the State of California.

The City Engineer may approve alternative means for establishing the certification of a Qualified SWPPP Preparer for Tier 2 or Tier 3 Construction SWPPPs upon submittal of a letter by the project proponent requesting approval of an alternative certification and presenting due cause why such alternative certification should be considered.

Projects requiring a Tier 1 Construction SWPPP shall use the City's Tier 1 Construction SWPPP Standard Template attached as Appendix H. No special qualification is required to prepare a Tier 1 Construction SWPPP.

3.2.4 Storm Water Certification Forms

For non-exempt projects, the project proponent must submit a certified Construction SWPPP (of the appropriate tier level) concurrent with any application for construction plan review including submittals for building plans, public and private improvement plans, grading plans, blasting plans, demolition plans, landscape plans and plans for right-of-way construction activities.

In addition to any other required construction plan review application submittal requirements, the project proponent must submit a completed and signed Storm Water Compliance Certification statement on the form prescribed in this Manual. A separate certification form is used corresponding to each of the three Construction SWPPP tier levels and for exempt projects. Copies of the required Storm Water Compliance Forms for Tier 2 and 3 Construction SWPPPs and for exempt projects are attached as Appendix B. The Storm Water Compliance statement for a Tier 1 Construction SWPPP is incorporated into the City's standard form Tier 1 Construction SWPPP attached as Appendix H.

After submittal of the application, City staff will review the Storm Water Compliance statement and either note concurrence with the proponents threat assessment at the bottom right hand corner of the Storm Water Compliance Form or reject the application as incomplete and return the application submittal package with a written explanation why the project threat assessment should be changed. See Cautionary Note in Chapter 3.2.1 above.

3.2.5 Project Threat to Storm Water Quality

Before a project construction permit can be issued for any project not found exempt from the Construction SWPPP requirements, a project's perceived threat to storm water quality must be determined. The Municipal Permit mandates that the City provide inspection commensurate with a project's perceived threat to storm water quality. The assessment criteria used to determine a project's perceived threat to storm water quality is not the same as the assessment criteria used to determine the tier level of Construction SWPPP for a project.

The worksheet entitled "Construction Threat Assessment Worksheet for Determination of Project's Perceived Threat to Storm Water Quality", attached as Appendix C, is used to determine the appropriate perceived threat to storm water compliance for a particular project. The projects perceived threat to storm water quality relates to the frequency of storm water compliance inspections required under the Municipal Permit and is one of the factors used to determine the City Construction SWPPP inspection fee. For more detailed information on storm water compliance inspections please refer to Chapter 3.4 of this manual.

3.2.6 Tier 3 Construction SWPPP Requirements

For projects that result in the disturbance of one acre or more of soil (individually or cumulatively through phased construction) and/or are determined to have a significant potential for water quality impairment, a Tier 3 Construction SWPPP shall be prepared in accordance with the requirements of the General Construction Permit and these standards.

3.2.6.1 Required Elements for Tier 3 Construction SWPPP

A Tier 3 Construction SWPPP must contain all of the elements required by the General Construction Permit, the Municipal Permit and these standards. The *TIER 3 CONSTRUCTION SWPPP REQUIRED ELEMENTS CHECKLIST*, attached as Appendix B, provides a complete listing of the required elements for a Tier 3 Construction SWPPP together with the regulatory source for each listed element. The checklist utilizes the same formatting as the checklist prepared by the State Water Resources Control Board entitled *STORM WATER POLLUTION PREVENTION PLAN AND MONITORING PROGRAM CHECKLIST*, modified to include elements required by the Municipal Permit and these standards.

The checklist is provided as an aid to those unfamiliar in the preparation of a Tier 3 Construction SWPPP. It is a comprehensive list of issues a SWPPP preparer must consider during the development of the document. Many sites, especially small construction sites, will not need to address some of the listed elements because they are not relevant to the site, the construction activities planned, or the construction materials used. The list allows the preparer to consider the applicability of the element to the specific circumstances of the site, and then determine to what extent the element should be addressed in the SWPPP.

The elements in the checklist are derived from Sections A, B, and C of the General Construction Permit, Section D.2. of the Municipal Permit, and these standards. The specific regulatory permit or City Standard chapter is listed in the second column. The third column indicates the page number(s) in the SWPPP document where the line item element is addressed. If the required element is not applicable to the specific project, then N/A should be noted in the fourth column. The fifth column is a space to note the scheduled date where any specified BMP elements will be implemented.

The use of this checklist does not guarantee compliance with the General Construction Storm Water Permit or these standards. Additionally, using the checklist to generate a Tier 3 Construction SWPPP is not a substitute for knowledge of the permit requirement. The checklist serves as a guidance document only. A site specific Tier 3 Construction SWPPP must be combined with proper and timely installation of the BMPs, thorough and frequent inspections, maintenance, and documentation.

3.2.6.2 Required Format for a Tier 3 Construction SWPPP

A Tier 3 Construction SWPPP shall be formatted in accordance with the SWPPP template included in the latest version of the "*California Stormwater BMP Handbook Construction*" prepared by the California Storm Water Quality Association (CASQA). As an alternative, the developer may use the Construction SWPPP format presented in the latest edition of the "*Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual*" prepared by Caltrans. The developer/owner/applicant must request approval for the use of the Caltrans format prior to submittal.

As an aide to the preparation of a Tier 3 Construction SWPPP document, the preparer may utilize the *Tier 3 CONSTRUCTION SWPPP CASQA FORMAT CHECKLIST (CASQA SWPPP Checklist)* included in Appendix C. The Tier 3 CASQA SWPPP Checklist is used by the City during its review of the Tier 3 Construction SWPPP documents.

The use of the checklist does not guarantee compliance with the General Construction Storm Water Permit or these standards. Additionally, using the checklist to generate a Tier 3 Construction SWPPP is not a substitute for knowledge of the permit requirement. The checklist serves as a guidance document only. A site specific Tier 3 Construction SWPPP must be combined with proper and timely installation of the BMPs, thorough and frequent inspections, maintenance, and documentation.

3.2.6.3 General Construction Permit Compliance Procedures

The General Construction Permit requires certain standard notifications to be made to the San Diego Regional Water Quality Control Board (SDRWQCB) prior to initiation of construction and after completion of construction as follows:

Notice of Intent (NOI) - It is the responsibility of the owner/developer/applicant to obtain coverage under the General Construction Permit through the filing of a Notice of Intent (NOI) with the SDRWQCB prior to commencement of construction activities. After City approval of the Tier 3 Construction SWPPP and prior to signature of the grading plans and/or issuance of grading permit for the project, the owner/developer/applicant shall submit the City approved Tier 3 Construction Permit, a filing fee and other required documentation to the SDRWQCB. Upon filing of the NOI, the project will be assigned a Waste Discharger's Identification (WDID) number by the SDRWQCB. The WDID number must be added into the Tier 3 Construction SWPPP and affixed onto the respective construction plans.

Notice of Termination (NOT) – Upon completion of the construction activity or transfer of ownership, the landowner shall file a NOT with the SDRWQCB certifying that all State and local requirements have been met in accordance with Special Provisions for Construction Activity, C.7, of the General Construction Permit.

Landowners who fail to obtain coverage of the General Construction Permit for storm water discharges to surface waters will be in violation of the CWA and the California Water Code.

To obtain a copy of the General Construction Permit, general information about the permit, fact sheets and copies of the various forms described below, visit the following website:

<http://www.swrcb.ca.gov/stormwtr/construction.html>

Once at the site click on the highlighted link titled "Construction General Permit, 99-08-DWQ".

3.2.7 Tier 2 Construction SWPPP Requirements

Construction activities that impact less than one acre and pose a moderate threat to water quality (as determined by the moderate threat assessment criteria contained in the Project Threat Assessment Worksheet attached as Appendix A) must prepare a Tier 2 Construction SWPPP in conformance with City Standards. Small linear underground or overhead utility projects must also comply with the requirements of the General Linear Utility Permit.

3.2.7.1 Required Elements for Tier 2 Construction SWPPP

A Tier 2 Construction SWPPP shall contain all of the elements as described on the “TIER 2 CONSTRUCTION SWPPP CHECKLIST” attached as Appendix G.

The use of the checklist does not guarantee compliance with these standards. The checklist serves as a guidance document only. A site specific Tier 2 Construction SWPPP must be combined with proper and timely installation of the BMPs, thorough and frequent inspections, maintenance, and documentation.

3.2.7.2 Required Format for Tier 2 Construction SWPPP

A Tier 2 Construction SWPPP shall be formatted in accordance with the template attached as Appendix F.

For small linear utility construction project subject to the General Linear Utility Permit, the project proponent shall follow the requirements of the General Linear Utility Permit for preparation of a Tier 2 Construction SWPPP. The Tier 2 SWPPP specified in the General Linear Utility Permit shall be submitted to the City in lieu of the City standard form Tier 2 Construction SWPPP.

3.2.8 Tier 1 Construction SWPPP Requirements

Construction activities that impact less than one acre and pose a low threat to water quality (as determined by the low threat assessment criteria contained in the Project Threat Assessment Worksheet attached as Appendix A) must prepare a standard format Tier 1 Construction SWPPP in conformance with City Standards. Small linear underground or overhead utility projects must also comply with the requirements of the General Linear Utility Permit.

3.2.8.1 Required Standard Format for Tier 1 Construction SWPPP

A Tier 1 Construction SWPPP shall utilize the standard form Tier 1 Construction SWPPP template attached as Appendix H. The standard form template includes the two sheets containing standard storm water prevention construction notes, a project information block, a Storm Water Compliance Statement, City approval block and a Best Management Practice (BMP) Checklist Table.

A Tier 1 level project that receives a “low perceived threat to storm water quality” rating as determined by the Construction Threat Assessment Worksheet, attached as Appendix C, need only complete and sign the first two sheets of the template. A Tier 1 level project that receives a “medium perceived threat to storm water quality” rating as determined by the Construction Threat Assessment Worksheet must additionally, attach

a site plan map sheet(s) showing the proposed construction site and depicting the areas of proposed construction and proposed location of structural BMPs. For a more detail description regarding the site plan requirements, see the site plan instruction sheet included with the template in Appendix H.

For all Tier 1 Construction SWPPPs, the property owner or owner's agent must complete the information in the Project Information block, check the appropriate boxes in the BMP Checklist Table and fill out and sign the Storm Water Compliance Statement. The form is intended to be completed as an "over the counter" type document for processing of construction permits for projects with a "low perceived threat to storm water quality". Projects with a "medium perceived threat to storm water quality", may require additional staff time to review the site plan included with the Tier 1 Construction SWPPP.

The BMP Checklist Table on page two of the standard form template is intended to be completed by the project proponent. The project proponent begins by checking the box to the left of each construction activity that will be performed during construction of the proposed project. Then, for each checked activity, the project proponent will pick one or more of the BMPs described along the top of the table that will be used to prevent storm water pollution resulting from that specific activity. The project proponent will then make a check in the box along the particular construction activity row that corresponds with the column for each BMP selected to help mitigate the potential storm water pollution effects of the activity. This process is repeated until all appropriate BMP boxes have been checked corresponding to each of the checked construction activities. Blank columns are included on the form to allow the applicant to add additional proposed BMPs not included on the standard table.

The owner/developer/contractor performing the construction work is responsible for ensuring that each of the selected BMPs is appropriately incorporated into the project during construction. The use of the BMP Checklist Table does not guarantee compliance with these standards. The BMP Checklist Table serves as a guidance document only. Additional BMPs may be required if the selected BMP(s) are shown to be ineffective or not relevant to a particular construction activity.

For small linear utility construction project subject to the General Linear Utility Permit, the project proponent shall follow the requirements of the General Linear Utility Permit for preparation of a Tier 1 Construction SWPPP. The Tier 1 SWPPP specified in the General Linear Utility Permit shall be submitted to the City in lieu of the City standard form Tier 1 Construction SWPPP.

3.2.9 General Linear Utility Permit Compliance Procedures

The General Linear Utility Permit requires certain standard notifications to be made to the San Diego Regional Water Quality Control Board (SDRWQCB) prior to initiation of construction and after completion of construction as described below. To obtain a copy of the General Linear Utility Permit, general information about the permit, fact sheets and copies of the various forms described below, visit the following website:

<http://www.swrcb.ca.gov/stormwtr/construction.html>

Once at the site click on the highlighted link titled "Small LUP General Permit".

3.2.9.1 Notice of Intent (NOI)

It is the responsibility of the owner/developer/applicant to obtain coverage under the General Linear Permit through the filing of a Notice of Intent (NOI) with the SDRWQCB prior to commencement of construction activities. After City approval of the Tier 2 or Tier 1 Construction SWPPP and prior to issuance of grading and/or right-of-way permit for the project, the project proponent shall submit the City approved Construction Permit, a filing fee and other required documentation to the SDRWQCB. Upon filing of the NOI, the project will be assigned a Waste Discharger's Identification (WDID) number by the SDRWQCB. The WDID number must be added into the Construction SWPPP and affixed onto the respective construction plans

3.2.9.2 General Linear Utility Permit - Tier 1 SWPPP

A single Tier 1 SWPPP prepared in accordance with the General Linear Utility Permit may authorize construction of any number of small utility projects. The Notice of Intent (NOI) and corresponding WDID number remains in effect until the discharger requests termination and such termination request is approved by the SDRWQCB.

3.2.9.2.1 Linear Construction Activity Notification (LCAN)

Prior to initiation of construction for each small utility project covered by the Tier 1 SWPPP, the discharger must submit a LCAN to the SDRWQCB prior to start of construction on the form provided for such purpose by the SDRWQCB. Alternatively, the discharger may submit a LCAN at least quarterly listing multiple small utility projects that will be constructed during the next quarter.

3.2.9.2.2 Linear Construction Termination Notification (LCTN)

At the conclusion of construction of small utility project covered by a Tier 1 SWPPP, the discharger must file a LCTN with the SDRWQCB certifying that the site was in full compliance with the requirements of the General Linear Utility Permit. The discharger may submit a single LCTN for multiple projects completed over a specified period of time. The LCTN submittal must include all required documentation requested by the SDRWQCB.

3.2.9.3 Notice of Termination (NOT)

Upon completion of the construction activity the discharger shall file a NOT with the SDRWQCB certifying that all construction activities were completed in full compliance with the requirements of the General Linear Utility Permit. For Tier 1 SWPPPs, filing of the NOT, and approval of the NOT by the SDRWQCB, will terminate permit coverage and work on additional small utility projects will no longer be permitted without obtaining an new Tier 1 or Tier 2 SWPPP. A NOT for a Tier 2 SWPPP indicates that the specified small utility project is complete and all work was done in compliance with the General Linear Utility Permit. When filing the NOT dischargers must use the NOT forms provided by the SDRWQCB.

3.2.9.4 City General Operating Permit (GOP)

The City's GOP procedures are intended to provide a mechanism for utility operators to conduct routine maintenance operations under a single permit. To avoid the need for

preparing and processing separate Construction SWPPPs for each routine maintenance operation, the City will allow preparation of a single Tier 1 Construction SWPPP to cover multiple small utility projects. The process will follow the same procedures as for a Tier 1 SWPPP prepared and processed in accordance with City Standards and the requirements of the General Linear Utility Permit.

The notification procedures described above shall apply with the following addition:

1. A copy of each LCAN shall be faxed to the City Construction Management and Inspection Division a minimum of 24 hours prior to start of construction. A copy of the fax notification shall be kept at the construction site. The copy shall be presented and shown upon demand to any City Official for verification of authority to work. A lack of 24-hour notification to the City for intended work may subject the operator to a stop-work notice.
2. A copy of the LCTN shall be submitted to the City Construction Management and Inspection Division concurrent with its submittal to the RWQCB.
3. A copy of the NOT shall be submitted to the City Construction Management and Inspection Division concurrent with its submittal to the RWQCB.

Any Small Utility Project that meets the requirements of a Tier 2 SWPPP pursuant to the General Linear Utility Permit requirements shall process a Tier 2 SWPPP consistent with Tier 2 Construction SWPPP procedures described above.

3.3 Construction BMP Standards

3.3.1 Background Information

Construction Best Management Practices (BMPs) are the schedules of activities, prohibitions of practices, maintenance procedures and other management practices employed during construction activities to prevent or reduce pollution of the ocean, lagoons, lakes, streams and other sensitive water bodies and water courses. Construction BMPs also include the physical devices and structural construction control measures designed to prevent soil erosion from occurring or to contain sediment before it leaves the construction site. The BMPs required pursuant this manual are also intended to protect the health, safety and welfare of the public and to prevent damage to adjoining public and private property resulting from construction activities.

The City of Carlsbad has adopted the California Stormwater Quality Association "Construction Stormwater Best Management Practice Handbook" (CASQA Construction Handbook) latest edition as its preferred source for construction BMPs. All BMP reference numbers used in this manual correspond to the BMP Fact Sheets included within the CASQA Construction Handbook unless specifically noted otherwise. With the approval of the City Engineer, or his/her designee, the City may accept comparable BMPs from reputable alternative sources such as Caltrans.

This manual is not intended as a comprehensive engineering or design manual on BMPs. The engineer or other qualified person, who prepares the Construction SWPPP, must utilize their individual knowledge and experience of BMPs together with the tools and reference materials described in this manual, or found elsewhere, to prepare an appropriate and adequate Construction SWPPP document.

The BMP categories below coincide with the BMP categories described in the CASQA Construction Handbook and provide a kind of checklist of the BMPs that are to be included in a Construction SWPPP. The combination or suite of BMPs that are included in a Construction SWPPP must reflect the specific conditions at the proposed construction site. An effective SWPPP includes a suite of BMPs that are designed to work together.

3.3.2 Minimum BMP Requirements

In accordance with the Municipal Permit, minimum BMPs must be installed for all projects to be implemented year-round. Because all sites, regardless of the priority, must be protected to prevent discharges to the maximum extent practicable, the minimum BMP requirements are the same for all projects requiring a Construction SWPPP. Each site must be protected by an effective combination of erosion and sediment controls, non-storm water management, materials and waste management controls, and general site management controls. The chapters following this chapter describe the minimum BMPs for each of the above listed BMP types that must be

incorporated into each Construction SWPPP prepared in accordance with these standards.

If particular BMPs are infeasible at any specific site, the owner/developer/contractor must install other equivalent BMPs. At any time of the year, an inactive site must be fully protected from erosion and discharges of sediment. A site will be considered inactive if construction activities have ceased for a period of ten or more consecutive days. It is also the owner/developer/contractors responsibility at both active and inactive sites to implement a plan to address all potential storm water and non-storm water discharges.

3.3.3 Erosion and Sediment Control BMPs

Erosion and sediment control BMPs are the structural and non-structural practices used during the construction process to keep sediment in place (erosion control) and to capture any sediment that is moved by stormwater before it leaves the site (sediment control). Erosion controls, keeping soil where it is, are the heart of any effective Construction SWPPP. The Construction SWPPP should rely on erosion controls as the primary means of preventing stormwater pollution. Sediment controls provide a necessary second line of defense to properly designed and installed erosion controls.

3.3.3.1 Erosion Control BMPs

Erosion control is any source control practice that protects the soil surface and prevents soil particles from being detached by rainfall, flowing water or wind. Erosion control is referred to as soil stabilization. Erosion control consists of preparing the soil surface and implementing one or more of the BMPs shown in Table 2.

All inactive soil-disturbed areas on the project site, and most active areas prior to the onset of rain, must be protected from erosion. Soil disturbed areas may include relatively flat areas as well as slopes. Typically, steep slopes and large exposed areas require the most robust erosion controls; flatter slopes and smaller areas still require protection, but less costly materials may be appropriate for these areas, allowing savings to be directed to the more robust BMPs for steep slopes and large exposed areas. To be effective, erosion control BMPs must be implemented at slopes and disturbed areas to protect them from concentrated flows.

Table 2 Erosion Control BMPs	
CASQA BMP#	BMP Name
EC-1	Scheduling
EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch
EC-4	Hydroseeding
EC-5	Soil Binders
EC-6	Straw Mulch
EC-7	Geotextiles & Mats
EC-8	Wood Mulching
EC-9	Earth Dikes and Drainage Swales
EC-10	Velocity Dissipation
EC-11	Slope Drains
EC-12	Streambank Stabilization
EC-13	Polyacrylamide

Some erosion control BMPs can be used effectively to temporarily prevent erosion by concentrated flows. These BMPs, used alone or in combination, prevent erosion by intercepting, diverting, conveying, and discharging concentrated flows in a manner that prevents soil detachment and transport. Temporary concentrated flow conveyance

controls may be required to direct run-on around or through the project in a non-erodible fashion. Temporary concentrated flow conveyance controls include EC-9 (Earth Dikes and Drainage Swales), EC-10 (Velocity Dissipation Devices) and EC-11 (Slope Drains).

3.3.3.2 Sediment Control BMPs

Sediment control is any practice that traps soil particles after they have been detached and moved by rain, flowing water, or wind. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them. Sediment control practices include the BMPs listed in Table 3.

Sediment control BMPs include those practices that intercept and slow or detain the flow of stormwater to allow sediment to settle and be trapped. Sediment control practices can consist of installing linear sediment barriers (such as silt fence, sandbag barrier, and straw bale barrier); providing fiber rolls, gravel bag berms, or check dams to break up slope length or flow; or constructing a sediment trap or sediment basin. Linear sediment barriers are typically placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around soil stockpiles, and at other appropriate locations along the site perimeter.

Table 3 Sediment Control BMPs	
CASQA BMP#	BMP Name
SE-1	Silt Fence
SE-2	Sediment Basin
SE-3	Sediment Trap
SE-4	Check Dam
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-7	Street Sweeping and Vacuuming
SE-8	Sandbag Barrier
SE-9	Straw Bale Barrier
SE-10	Storm Drain Inlet Protection
SE-11	Chemical Treatment

A few BMPs may control both sediment and erosion, for example, fiber rolls and sand bag barriers. The CASQA Construction Handbook classifies these BMPs as either erosion control (EC) or sediment control (SC) based on the BMPs most common and effective use. Sediment control BMPs are most effective when used in conjunction with erosion control BMPs. The combination of erosion control and sediment control is usually the most effective means to prevent sediment from leaving the project site and potentially entering storm drains or receiving waters. The City of Carlsbad requires that the discharger implement an effective combination of erosion and sediment controls.

Under limited circumstances, sediment control, alone may be appropriate. For example, applying erosion control BMPs to an area where excavation, filling, compaction, or grading is currently under way may not be feasible when storms come unexpectedly. Use of sediment controls by establishing perimeter control on these areas may be appropriate and allowable provided the following conditions are met:

- Weather monitoring is under way.
- Inactive soil-disturbed areas have been protected with an effective combination of erosion and sediment controls.
- An adequate supply of sediment control materials is stored on-site and there are sufficient forces of labor and equipment available to implement sediment controls on the active area prior to the onset of rain.
- The SWPPP adequately describes the methods to protect active areas.

3.3.3.3 Wind Erosion Control BMPs

Wind erosion control consists of applying water or other dust palliatives to prevent or alleviate dust nuisance. Wind erosion control best management practices BMPs are shown in Table 4.

Table 4 Wind Erosion Control BMPs	
CASQA BMP#	BMP Name
WE-1	Wind Erosion Control

Other BMPs that are sometimes applied to disturbed soil areas in order to control wind erosion are BMPs EC-2 through EC-7, shown in Chapter 3.3.2.1 above. Be advised that many of the dust palliatives may contain compounds that have an unknown effect on stormwater. A sampling and analysis protocol to test for stormwater contamination from exposure to such compounds is required in the SWPPP.

3.3.3.4 Tracking Control BMPs

Tracking control consists of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area. Tracking control best management practices (BMPs) are shown in Table 5.

Table 5 Tracking Control BMPs	
CASQA BMP#	BMP Name
TR-1	Stabilized Construction Ingress/Egress
TR-2	Stabilized Construction Roadway
TR-3	Ingress/Egress Tire Wash

Attention to control of tracking sediment off site is highly recommended, as dirty streets and roads near a construction site create a nuisance to the public and generate constituent complaints to elected officials and regulators. These complaints often result in immediate inspections and regulatory actions.

3.3.4 Non-Storm Water Management BMPs

Carlsbad Standards prohibit the discharge of materials other than stormwater and authorized non-stormwater discharges. It is recognized that certain non-stormwater discharges may be necessary for the completion of construction projects. Such discharges include but are not limited to irrigation of vegetative erosion control measures, pipe flushing and testing, and street cleaning.

Non-stormwater management BMPs are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source or eliminating off-site discharge. These practices involve day-to-day operations of the construction site and are usually under the control of the contractor. These BMPs are also referred to as “good housekeeping practices” which involve keeping a clean, orderly construction site.

Non-stormwater management BMPs also include procedures and practices designed to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning, fueling, and maintenance operations to stormwater drainage systems or to watercourses.

Table 6 lists standard non-stormwater management BMPs. All these BMPs must be implemented depending on the conditions and applicability of deployment described as part of the BMP.

It is recommended that owners and contractors be vigilant regarding implementation of these BMPs, including making their implementation a condition of continued employment, and part of all prime and subcontract agreements. By doing so, the chance of inadvertent violation by an uncaring individual can be prevented, potentially saving thousands of dollars in fines and project delays. Also, if procedures are not properly implemented and/or if BMPs are compromised then the discharge is subject to sampling and analysis requirements contained in the General Construction Permit.

Table 6 Non-Storm Water Management BMPs	
CASQA BMP#	BMP Name
NS-1	Water Conservation Practices
NS-2	Dewatering Operations
NS-3	Paving and Grinding Operations
NS-4	Temporary Stream Crossing
NS-5	Clear Water Diversion
NS-6	Illicit Connection/Discharge
NS-7	Potable Water/Irrigation
NS-8	Vehicle and Equipment Cleaning
NS-9	Vehicle and Equipment Fueling
NS-10	Vehicle and Equipment Maintenance
NS-11	Pile Driving Operations
NS-12	Concrete Curing
NS-13	Concrete Finishing
NS-14	Material and Equipment Use
NS-15	Demolition Adjacent to Water
NS-16	Temporary Batch Plants

3.3.5 Waste Management and Materials Pollution Control BMPs

Waste management and materials pollution control BMPs, like non-stormwater management BMPs, are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with stormwater. These BMPs also involve day-to-day operations of the construction site, are under the control of the contractor, and are additional “good housekeeping practices” which involve keeping a clean, orderly construction site.

Waste management consists of implementing procedural and structural BMPs for handling, storing, and disposing of wastes generated by a construction project. The objective is to prevent the release of waste materials into stormwater runoff or discharges through proper management of the following types of wastes:

- Solid
- Sanitary
- Hazardous
- Equipment-related wastes

Materials pollution control (also called materials handling) consists of implementing procedural and structural BMPs in the handling, storing, and the use of construction materials. The BMPs are intended to prevent the release of pollutants during stormwater and non-stormwater discharges. The objective is to prevent or reduce the opportunity for contamination of stormwater runoff from construction materials by covering and/or providing secondary containment of storage areas, and by taking adequate precautions when handling materials. These controls must be implemented for all applicable activities, material usage, and site conditions.

Table 7 lists the waste management and materials pollution control BMPs. It is important to note that these BMPs should be implemented depending on the conditions/applicability of deployment described as part of the BMP.

3.3.6 General Site Management Requirements

Every construction site shall implement the following minimum general site management requirements:

1. Emphasize pollution prevention where appropriate; and,
2. Implement all the requirements of the site approved Construction SWPPP to manage storm water and non-storm water discharges from the site at all times; and,

Table 7 Waste Management and Materials Pollution Control BMPs	
CASQA BMP#	BMP Name
WM-1	Material Delivery and Storage
WM-2	Material Use
WM-3	Stockpile Management
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Waste Management
WM-7	Contaminated Soil Management
WM-8	Concrete Waste Management
WM-9	Sanitary/ Septic Waste Management
WM-10	Liquid Waste Management

3. Minimize areas that are cleared and graded to only the portion of the site that is necessary for construction; and,
4. Minimize exposure time of disturbed soil areas; and,
5. Minimize grading during the wet season and coincide grading with seasonal dry weather periods to the extent feasible. If grading does occur during the wet season, then implement additional BMPs for any rain events that may occur; and,
6. Limit the amount of exposed soil allowed at one time to the amount that which can be adequately protected by deploying standby erosion control and sediment control BMPs prior to a predicted rainstorm; and,
7. Temporarily stabilize and/or re-seed disturbed soil areas as rapidly as possible; and,
8. Preserve the natural hydrologic features of the site where feasible; and,
9. Preserve riparian buffers and corridors where feasible; and,
10. Maintain all BMPs until removed; and,
11. Retain, reduce and properly manage all pollutant discharges on-site to the MEP standard.

3.3.6.1 Dry Season Site Management Requirements

The following minimum BMPs must be in place at all construction sites throughout the year during both the wet and dry seasons:

1. All graded areas must have erosion protection BMPs properly installed
2. Adequate perimeter protection BMPs must be installed and maintained.
3. Adequate sediment control BMPs must be installed and maintained.
4. Adequate BMPs to control offsite sediment tracking must be installed and maintained.
5. A minimum of 125% of the material needed to install standby BMPs to protect the exposed areas from erosion and prevent sediment discharges, must be stored onsite. Areas already protected from erosion using physical stabilization or established vegetation stabilization BMPs are not considered to be “exposed” for purposes of this requirement.
6. The owner/developer/contractor must have an approved “weather triggered” action plan and be able to deploy standby BMPs to completely protect the exposed portions of the site within 48 hours of a predicted storm event (a predicted storm event is defined as a forecasted, 40% chance of rain by 5-day National Weather Service). On request, the owner/developer/contractor must provide proof of this capability that is acceptable to the City.
7. Deployment of physical or vegetation erosion control BMPs must commence as soon as slopes are completed. The project proponent may not continue to rely on the ability to deploy standby BMP materials to prevent erosion of slopes that have been completed.
8. The area that can be cleared, graded, and left exposed at one time is limited to the amount of acreage that the contractor can adequately protect prior to a predicted rainstorm. For larger sites, grading should be phased (See Chapter 3.3.8). It may be necessary to deploy erosion and sediment control BMPs in areas that are not completed, but are not actively being worked before additional grading is done.

3.3.6.2 Rainy Season Site Management Requirements

In addition to the dry season requirements described above, the following additional minimum BMPs must be in place at all sites during the rainy season, which is defined as October 1st through April 30th:

- 1) Erosion control, perimeter protection and sediment control BMPs must be upgraded if necessary to provide sufficient protection for storms likely to occur during the rainy season.
- 2) Adequate physical or vegetation erosion control BMPs must be installed and established for all completed slopes prior to the start of the rainy season. These BMPs must be maintained throughout the rainy season. If a selected BMP fails, it must be repaired and improved, or replaced with an acceptable alternate as soon as it is safe to do so. The failure of a BMP indicates it was not adequate for the circumstances in which it was used. Repairs or replacements must therefore put a more robust BMP in place.
- 3) The amount of exposed soil allowed at one time shall not exceed that which can be adequately protected by deploying standby erosion control and sediment control BMPs prior to a predicted rainstorm.
- 4) A disturbed area that is not completed but that is not being actively graded must be fully protected from erosion if left for 10 or more days. The ability to deploy standby BMP materials is not sufficient for these areas. BMPs must actually be deployed.
- 5) All vegetation erosion control must be established prior to the rainy season to be considered as an effective BMP.

3.3.7 Additional Controls for Construction Sites

For project sites that are tributary to 303(d) water body segments that are impaired for sediment, the following BMPs must be implemented at all times to the maximum extent possible:

- Maintain vegetative cover as much as possible by developing the project in a phased approach to reduce the amount of exposed soil at any one time.
- Limit the areas of active construction to five acres at any one time.
- Provide 100 percent soil cover for all areas of inactive construction throughout the entire time of construction, on a year-round basis.
- Provide appropriate perimeter control at all appropriate locations along the site perimeter and at all inlets to the storm drain system at all times during the rainy season.
- Provide vegetated buffer strips between the active construction area and any water bodies.
- Provide stabilized construction entrances and limit all vehicle and foot traffic to those entrances.

Where the provisions described above can not be accommodated, additional or supplemental controls shall be recommended. The City Engineer or designee shall have the authority to approve supplemental or alternative control methods based upon an evaluation of the proposed control and the sites potential threat to storm water quality impairment.

3.3.8 Maximum Disturbed Area for Erosion Control

The active disturbed soil area of any project site shall be not more than 50 acres for an individual grading permit or a combination of grading permits under an associated Tentative or Final Map. The City may approve, on a case-by-case basis, expansions of the active disturbed soil area limit if adequate site protection is demonstrated. At all times, sufficient soil stabilization and sediment control materials shall be maintained on site to provide adequate site protection.

3.3.9 Advanced Treatment Methods

Advanced Treatment is defined in the Municipal Permit as the use “of mechanical or chemical means to flocculate and remove suspended sediment from runoff from construction sites prior to discharge.”

If a project meets all of the following criteria, advanced treatment will be required:

1. All or part of the site is within 200 feet of waters named on the CWA Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity;
2. The disturbance area is greater than five acres, including all phases of the development;
3. The disturbed slopes are steeper than 4:1 with at least 10 feet of relief, and drain toward a Section 303(d) listed receiving water for sedimentation or turbidity;
4. The site contains a predominance of soils with USDA-NRCS Erosion factors k_f greater than or equal to 0.4.

Advanced treatment may be required on sites that do not meet all four of the criteria for exceptional threat to water quality listed above at the discretion of the City Engineer based on a record on non-compliance.

Treatment effluent water quality shall meet or exceed the water quality objectives for sediment, turbidity, pH, and toxicity as listed in the Water Quality Control Plan for the San Diego Basin (9) for inland surface waters and lagoons and estuaries for the appropriate hydrologic unit.

Prior to obtaining a grading permit, the applicant shall submit, to the satisfaction of the City Engineer, the following:

1. An operations and maintenance schedule for all advanced treatment methods.
2. A monitoring plan for all required BMPs and water quality for all proposed work deemed necessary to achieve project water quality goals.
3. A written training plan for certification and documentation of necessary training and refreshers of staff.

The discharger shall either deploy Advanced Treatment Methods or comply with source control procedures described below.

- Maintain vegetative cover as much as possible by developing the project in a phased approach to reduce the amount of exposed soil at any one time.

- Limit the areas of active construction to five acres at any one time.
- Provide 100 percent soil cover for all areas of inactive construction throughout the entire time of construction, on a year-round basis.
- Provide appropriate perimeter control at all appropriate locations along the site perimeter and at all inlets to the storm drain system at all times during the rainy season.
- Provide vegetated buffer strips between the active construction area and any water bodies.
- Provide stabilized construction entrances and limit all vehicle and foot traffic to those entrances.

3.3.10 City Standard Water Pollution Prevention Notes

All Tier 2 and Tier 3 Construction SWPPPs shall include the City Standard Storm Water Pollution Prevention notes as specified in Appendix I. The notes shall be placed upon the Construction SWPPP drawing or, in the case of a Tier 3 Construction SWPPP, on the grading plan. The Qualified Plan Preparer may include supplemental Storm Water Pollution Prevention notes to address specific requirements of the proposed project and/or construction site. The City Engineer or designee may also request inclusion of supplemental Storm Water Pollution Prevention notes to address specific construction activities or site issues.

3.4 Storm Water BMP Inspection and Maintenance

3.4.1 General information

Construction is a dynamic operation where changes are expected. Storm water BMPs for construction sites are usually temporary measures that require frequent maintenance to maintain their effectiveness and may require relocation, revision and re-installation, particularly as project grading progresses. Therefore, in addition to City inspections, owner/developer/contractor self- inspections are required.

3.4.2 Inspection of Construction Sites

All construction sites are subject to site inspection by City staff in accordance with the Carlsbad Municipal Code, the Municipal Permit, City's policies and procedures and these standards. Additionally, owner/developer/contractors are required to perform self-inspection of construction sites, for projects requiring a Tier 2 or Tier 3 Construction SWPPP, in accordance with these standards.

The City of Carlsbad will evaluate the adequacy of the owner's/contractor's site management for storm water pollution prevention, inclusive of BMP implementation, on construction sites based on performance standards for storm water BMPs. Poor BMP practices shall be challenged. Performance standards shall include:

1. Prevent increase in pollution to the maximum extent practicable.
2. Minimize slope erosion.
3. Control discharge velocities moving offsite to limit down stream erosion potential to the pre-construction levels.

3.4.3 City Storm Water BMP Inspection Frequency

Each construction site must be inspected by City staff for compliance with storm water standards at the minimum frequency as shown in Table 8. Site-specific inspection frequencies are reevaluated periodically, particularly when grading activities are being conducted during the rainy season. The need for additional inspections may vary depending upon several factors including:

- Site conditions;
- Previous violations;
- History of developer or contractor past performance;
- Grading during rainy season; and,
- Weather patterns.

Table 8		
	Inspection Frequency	
Site Threat to Water Quality	Rainy Season Oct 1st – April 30th	Dry Season May 1st – September 30th
High	Bi-weekly	As-needed
Medium	Monthly	As-needed
Low	As-needed	As-needed

The minimum inspection frequency is based upon a project's perceived Threat to Water Quality (TTWQ) and whether or not the construction occurs during the wet or dry season. Each project site is assigned one of three priorities to describe its TTWQ - low, medium or high. The worksheet entitled "Construction Threat Assessment Worksheet for Determination of Project's Perceived Threat to Water Quality", attached as Appendix A, is used to determine a construction site's TTWQ priority.

3.4.4 City Storm Water BMP Inspection Requirements

City inspection of construction sites for storm water compliance shall include, but not be limited to the following:

1. Assessment of BMP effectiveness including implementation of an effective combination of erosion, sediment and non-stormwater BMPs to meet the City's minimum water quality protection requirements and prevent the discharge of pollutants into storm water and receiving waters, and
2. Check for coverage under the General Construction Permit (Regional Board Notice of Intent (NOI) and/or Waste Discharge Identification No. (WDID No.)) during initial inspection;
3. Ensure compliance with the City's applicable ordinances, permits and other site-specific requirements;
4. Visual observations for non-stormwater discharges, potential illicit connections and potential discharge of pollutants in stormwater runoff;
5. Ensure proper implementation of plans and specifications,
6. Education and outreach on stormwater pollution prevention as needed;
7. Ensure that the project proponents implement their stormwater management on a year-round basis, and;
8. Creation of a written or electronic inspection report

City inspection staff will utilize the following framework when conducting an inspection:

1. Review the site erosion control and BMP implementation plans and determine whether they are being properly implemented;
2. Determine if BMPs are being used in accordance with the intent of all laws and approved plans;
3. Determine whether BMPs are effectively being implemented and maintained properly; and

4. Determine whether the owner/developer/contractor is making appropriate adjustments when ineffective BMPs are found.

For projects subject to the State General Construction Permit, the RWQCB is responsible for verifying and enforcing requirements of the General Construction Permit. The City inspection staff will continue to work with RWQCB staff in assuring compliance at these sites. City staff will document observations of potential violations and will notify the RWQCB of the noncompliance in accordance with Order R9-2007-0001 if the noncompliance poses a threat to human or environmental health.

Regardless of any inspections conducted by the City, property owners or contractors are required to prevent any construction-related materials, trash, wastes, spills or residues from entering a storm water conveyance system.

3.4.5 Qualified Person Required

All construction sites requiring a Tier 2 or Tier 3 Construction SWPPP are required to employ a Qualified Person to ensure proper installation and maintenance of the project BMPs. The Qualified Person shall:

1. Be trained and competent in the use of BMPs, shall be on site daily, although not necessarily full time, to evaluate the conditions of the site with respect to storm water pollution prevention. This qualified contact person shall represent the contractor/owner on storm water issues.
2. Shall implement the conditions of the Storm Water Pollution Prevention Plan, contract documents and/or local ordinances with respect to erosion and sediment control and other waste management regulations.
3. Be responsible for monitoring the weather and implementation of any emergency plans as needed. The weather shall be monitored on a 5-day forecast plan and a full BMP protection plan shall be activated when there is a 40% chance of rain.
4. Be responsible for overseeing any site grading and operations and evaluating the effectiveness of the BMPs. This person shall modify the BMPs as necessary to keep the dynamics of the site in compliance. This person or other qualified persons are responsible for checking the BMPs routinely for maintenance and documenting the BMPs being implemented.

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Appendix A

Project Threat Assessment Worksheet for Determination of Construction SWPPP Tier Level



Project Threat Assessment Worksheet for Determination of Construction SWPPP Tier Level

Project Storm Water Threat Assessment Criteria*	Construction SWPPP Tier Level
<p><u>Significant Threat Assessment Criteria</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> My project includes clearing, grading or other disturbances to the ground resulting in soil disturbance totaling one or more acres including any associated construction staging, equipment storage, stockpiling, pavement removal, refueling and maintenance areas; or, <input type="checkbox"/> My project is part of a phased development plan that will cumulatively result in soil disturbance totaling one or more acres including any associated construction staging, equipment storage, refueling and maintenance areas; or, <input type="checkbox"/> My project is located inside or within 200 feet of an environmentally sensitive area (see City ESA Proximity map) and has a significant potential for contributing pollutants to nearby receiving waters by way of storm water runoff or non-storm water discharge(s). 	Tier 3
<p><u>Moderate Threat Assessment Criteria</u></p> <p>My project does not meet any of the Significant Threat Assessment Criteria described above and meets one or more of the following criteria:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Project requires a grading plan pursuant to the Carlsbad Grading Ordinance (Chapter 15.16 of the Carlsbad Municipal Code); or, <input type="checkbox"/> Project will result in 2,500 square feet or more of soils disturbance including any associated construction staging, stockpiling, pavement removal, equipment storage, refueling and maintenance areas and project meets one or more of the additional following criteria: <ul style="list-style-type: none"> • located within 200 feet of an environmentally sensitive area or the Pacific Ocean; and/or, • disturbed area is located on a slope with a grade at or exceeding 5 horizontal to 1 vertical; and/or • disturbed area is located along or within 30 feet of a storm drain inlet, an open drainage channel or watercourse; and/or • construction will be initiated during the rainy season or will extend into the rainy season (Oct. 1 through April 30). 	Tier 2
<p><u>Low Threat Assessment Criteria</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> My project does not meet any of the Significant or Moderate Threat criteria, is not an exempt permit type (see City's list of Permit Types Exempt from Construction SWPPP requirements) and the project meets one or more of the following criteria: <ul style="list-style-type: none"> • results in some soil disturbance; and/or • includes outdoor construction activities (such as roofing, saw cutting, equipment washing, material stockpiling, vehicle fueling, waste stockpiling) 	Tier 1
<p><u>No Threat Project Assessment Criteria</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> My project is in a category of permit types exempt from City Construction SWPPP requirements (see City's list of Permit Types Exempt from Construction SWPPP requirements) and/or does not meet any of the High, Moderate or Low Threat criteria described above. 	Exempt

* The City Engineer may authorize minor variances from the Storm Water Threat Assessment Criteria in special circumstances where it can be shown that a lesser or higher Construction SWPPP Tier Level is warranted in the opinion of the City Engineer

Appendix B

Storm Water Compliance Forms



Storm Water Compliance Form For a Tier 3 Construction SWPPP

I am applying to the City of Carlsbad for the following type of construction permit(s):

☐ Grading Permit ☐ Building Permit ☐ Right-of-Way Permit

My project requires preparation and approval of a Tier 3 Construction Storm Water Pollution Prevention Plan (SWPPP) because my project meets one or more of the following criteria demonstrating that the project potentially poses a significant threat to storm water quality:

- ☐ My project includes clearing, grading or other disturbances to the ground resulting in soil disturbance totaling one or more acres including any associated construction staging, equipment storage, stockpiling, pavement removal, refueling and maintenance areas; or,
- ☐ My project is part of a phased development plan that will cumulatively result in soil disturbance totaling one or more acres including any associated construction staging, equipment storage, stockpiling, pavement removal, refueling and maintenance areas; or,
- ☐ My project is located inside or within 200 feet of an environmentally sensitive area and has a significant potential for contributing pollutants to nearby receiving waters by way of storm water runoff or non-storm water discharge(s).

I CERTIFY TO THE BEST OF MY KNOWLEDGE THAT THE ABOVE CHECKED STATEMENTS ARE TRUE AND CORRECT.

I AM SUBMITTING FOR CITY APPROVAL A TIER 3 CONSTRUCTION SWPPP PREPARED IN ACCORDANCE WITH CITY STANDARDS AND THE REQUIREMENTS OF THE STATE WATER RESOURCES CONTROL BOARD GENERAL PERMIT FOR CONSTRUCTION ACTIVITIES - WATER QUALITY ORDER NO 99-08-DWQ (GENERAL CONSTRUCTION PERMIT) AND ANY AMENDMENT, REVISION OR RE-ISSUANCE THEREOF.

I UNDERSTAND AND ACKNOWLEDGE THAT I MUST SUBMIT THE CITY APPROVED TIER 3 CONSTRUCTION SWPPP TO THE SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD TOGETHER WITH A NOTICE OF INTENTION (NOI), AN APPROPRIATE FILING FEE AND OTHER REQUIRED DOCUMENTATION AND RECEIVE A STATE WASTE DISCHARGER'S IDENTIFICATION (WDID) NUMBER PRIOR TO CITY ISSUANCE OF THE ABOVE REQUESTED CONSTRUCTION PERMIT(S).

I ALSO UNDERSTAND AND ACKNOWLEDGE THAT I MUST ADHERE TO, AND AT ALL TIMES, COMPLY WITH THE CITY APPROVED TIER 3 CONSTRUCTION SWPPP THROUGHTOUT THE DURATION OF THE CONSTRUCTION ACTIVITIES UNTIL THE CONSTRUCTION WORK IS COMPLETE AND APPROVED BY THE CITY OF CARLSBAD.

Owner/Owner's Authorized Agent Information and Signature Box

This Box for City Use Only

Address/Location:		Assessor Parcel Number(s):	
Owner/Owner's Authorized Agent Name:		Title:	
Owner/Owner's Authorized Agent Signature:		Date:	

City Concurrence:	Yes	No
By:		
Date:		
Project ID:		



Storm Water Compliance Form For a Tier 2 Construction SWPPP

I am applying to the City of Carlsbad for one or more the following type of construction permit(s):

- ☐ Grading Permit ☐ Building Permit ☐ Right-of-Way Permit

My project does not meet any of the following criteria for a project that poses a significant threat to storm water quality:

- ✓ My project does not include clearing, grading or other ground disturbances resulting in soil disturbance totaling one or more acres including any associated construction staging, equipment storage, stockpiling, pavement removal, refueling and maintenance areas; and,
- ✓ My project is not part of a phased development plan that will cumulatively result in soil disturbance totaling one or more acres including any associated construction staging, equipment storage, stockpiling, pavement removal, refueling and maintenance areas; and,
- ✓ My project is not located inside or within 200 feet of an environmentally sensitive area and will not have a significant potential for contributing pollutants to nearby receiving waters by way of storm water runoff or non-storm water discharge(s).

My project requires preparation and approval of a Tier 2 Construction Storm Water Pollution Prevention Plan (SWPPP) because my project meets one or more of the following criteria demonstrating that the project potentially poses a moderate threat to storm water quality:

- ☐ My project requires a grading plan pursuant to the Carlsbad Grading Ordinance (Chapter 15.16 of the Carlsbad Municipal Code); and/or,
- ☐ My Project will result in 2,500 square feet or more of soils disturbance including any associated construction staging, stockpiling, pavement removal, equipment storage, refueling and maintenance areas and, my project meets one or more of the following additional criteria:
 - Project is located within 200 feet of an environmentally sensitive area or the Pacific Ocean;
 - Project's disturbed area is located on a slope with a grade at or exceeding 5 horizontal to 1 vertical;
 - Project's disturbed area is located along or within 30 feet of a storm drain inlet, an open drainage channel or watercourse; and/or
 - Project will be initiated during the rainy season or will extend into the rainy season (Oct. 1 through April 30).

I CERTIFY TO THE BEST OF MY KNOWLEDGE THAT THE ABOVE CHECKED STATEMENTS ARE TRUE AND CORRECT. I AM SUBMITTING FOR CITY APPROVAL A TIER 2 CONSTRUCTION SWPPP PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF CITY STANDARDS.

I UNDERSTAND AND ACKNOWLEDGE THAT I MUST ADHERE TO, AND AT ALL TIMES, COMPLY WITH THE CITY APPROVED TIER 2 CONSTRUCTION SWPPP THROUGHOUT THE DURATION OF THE CONSTRUCTION ACTIVITIES UNTIL THE CONSTRUCTION WORK IS COMPLETE AND APPROVED BY THE CITY OF CARLSBAD.

Owner/Owner's Authorized Agent Information and Signature Box

This Box for City Use Only

Address/Location:		Assessor Parcel Number(s):	
Owner/Owner's Authorized Agent Name:		Title:	
Owner/Owner's Authorized Agent Signature:		Date:	

City Concurrence:	Yes	No
By:		
Date:		
Project ID:		



Storm Water Compliance Exemption Form

I am applying to the City of Carlsbad for the following type(s) of construction permit:

☐ Building Permit ☐ Right-of-Way Permit

- ☐ My project is categorically exempt from the requirement to prepare a storm water pollution prevention plan (SWPPP) because it only requires issuance of one or more of the following permit types:

Electrical Permit Fire Additional Permit Fire Alarm Permit Fixed Systems Permit Mechanical Permit Mobile Home Permit Re-Roofing Permit	Patio Deck Plumbing Permit Sign Permit Spa – Factory Made Sprinkler Permit Water Discharge Permit
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- ☐ My project is exempt from the requirement to prepare a storm water pollution prevention plan (SWPPP) because it meets the “no threat” assessment criteria on the City’s Project Threat Assessment Worksheet for Determination of Construction SWPPP Tier Level.

I CERTIFY TO THE BEST OF MY KNOWLEDGE THAT THE ABOVE CHECKED STATEMENTS ARE TRUE AND CORRECT.

I UNDERSTAND AND ACKNOWLEDGE THAT EVEN THOUGH THIS PROJECT DOES NOT REQUIRE PREPARATION OF A CONSTRUCTION SWPPP, I MUST STILL ADHERE TO, AND AT ALL TIMES DURING CONSTRUCTION ACTIVITIES FOR THE PERMIT TYPE(S) CHECKED ABOVE, COMPLY WITH THE STORM WATER BEST MANAGEMENT PRACTICES PURSUANT TO TITLE 15 OF THE CARLSBAD MUNICIPAL CODE AND TO CITY STANDARDS.

Owner/Owner's Authorized Agent Information and Signature Box

Address/Location: Number(s):		Assessor Parcel	
Owner/Owner's Authorized Agent Name:		Title:	
Owner/Owner's Authorized Agent Signature:		Date:	

This Box for City Use Only

City Concurrence:	Yes	No
By:		
Date:		
Project ID:		

Appendix C

Construction Threat Assessment Worksheet for Determination of Threat to Storm Water Quality



Construction Threat Assessment Worksheet for Determination of a Project's Perceived Threat to Storm Water Quality

Construction SWPPP Tier Level	Construction Threat Assessment Criteria*	Perceived Threat to Storm Water Quality
Tier 3	<u>Tier 3 – High Construction Threat Assessment Criteria</u> <input type="checkbox"/> Project site is 50 acres or more and grading will occur during the rainy season <input type="checkbox"/> Project site is 1 acre or more in size and is located within the Buena Vista or Agua Hedionda Lagoon watershed, inside or within 200 feet of an environmentally sensitive area (ESA) or discharges directly to an ESA <input type="checkbox"/> Soil at site is moderately to highly erosive (defined as having a predominance of soils with USDA-NRCS Erosion factors k_f greater than or equal to 0.4) <input type="checkbox"/> Site slope is 5 to 1 or steeper <input type="checkbox"/> Construction is initiated during the rainy season or will extend into the rainy season (Oct. 1 through April 30). <input type="checkbox"/> Owner/contractor received a Storm Water Notice of Violation within past two years	High
	<u>Tier 3 – Medium Construction Threat Assessment Criteria</u> <input type="checkbox"/> All projects not meeting Tier 3 High Construction Threat Assessment Criteria	Medium
Tier 2	<u>Tier 2 High Construction Threat Assessment Criteria</u> <input type="checkbox"/> Project is located within the Buena Vista or Agua Hedionda Lagoon watershed, inside or within 200 feet of an environmentally sensitive area (ESA) or discharges directly to an ESA <input type="checkbox"/> Soil at site is moderately to highly erosive (defined as having a predominance of soils with USDA-NRCS Erosion factors k_f greater than or equal to 0.4) <input type="checkbox"/> Site slope is 5 to 1 or steeper <input type="checkbox"/> Construction is initiated during the rainy season or will extend into the rainy season (Oct. 1 through April 30). <input type="checkbox"/> Owner/contractor received a Storm Water Notice of Violation within past two years <input type="checkbox"/> Site results in one half acre or more of soil disturbance	High
	<u>Tier 2 – Medium Construction Threat Assessment Criteria</u> <input type="checkbox"/> All projects not meeting Tier 2 High Construction Threat Assessment Criteria	Medium
Tier 1	<u>Tier 1 - Medium Inspection Threat Assessment Criteria</u> <input type="checkbox"/> Project is located within the Buena Vista or Agua Hedionda Lagoon watershed, within or directly adjacent to an environmentally sensitive area (ESA) or discharges directly to an ESA <input type="checkbox"/> Soil at site is moderately to highly erosive (defined as having a predominance of soils with USDA-NRCS Erosion factors k_f greater than or equal to 0.4) <input type="checkbox"/> Site slope is 5 to 1 or steeper <input type="checkbox"/> Construction is initiated during the rainy season or will extend into the rainy season (Oct. 1 through April 30). <input type="checkbox"/> Owner/contractor received a Storm Water Notice of Violation within past two years <input type="checkbox"/> Site results in one half acre or more of soil disturbance	Medium
	<u>Tier 1 - Low Inspection Threat Assessment Criteria</u> <input type="checkbox"/> All projects not meeting Tier 1 Medium Construction Threat Assessment Criteria	Low
Exempt	- Not Applicable -	Exempt

* The City Engineer may authorize minor variances from the Construction Threat Assessment Criteria in special circumstances where it can be shown that a lesser or higher amount of storm water compliance inspection is warranted in the opinion of the City Engineer

Appendix D

Tier 3 Construction SWPPP Required Elements Checklist



TIER 3 CONSTRUCTION SWPPP REQUIRED ELEMENTS CHECKLIST

Project Name _____ Project ID _____ SWPPP Preparer _____ Date _____

Construction SWPPP Required Element	Reference Document and Section (1)	Page Number (2)	Not Applicable N/A	Implementation Date (3)
GCP Section A. Storm Water Pollution Prevention Plan (SWPPP)				
<i>Vicinity Map (graphic)</i>	<i>GCP A.5.a.1</i>			
Major roadways, geographic features or landmarks	<i>GCP A.5.a.1</i>			
Site perimeter	<i>GCP A.5.a.1</i>			
Geographic features	<i>GCP A.5.a.1</i>			
General topography	<i>GCP A.5.a.1</i>			
<i>Site Map (graphic)(can modify Parcel Map)</i>	<i>GCP A.5.a.2</i>			
Site perimeter	<i>GCP A.5.a.2</i>			
Existing and proposed buildings, lots, and roadways	<i>GCP A.5.a.2</i>			
Storm water collection and discharge points	<i>GCP A.5.a.2</i>			
General topography before and after construction	<i>GCP A.5.a.2</i>			
Anticipated discharge location(s)	<i>GCP A.5.a.2</i>			
Drainage patterns	<i>GCP A.5.a.2</i>			
Relevant drainage areas 2	<i>GCP A.5.a.</i>			
Temporary on-site drainage	<i>GCP A.5.a.2</i>			
<i>Drainage (graphic)</i>	<i>GCP A.5.b.1</i>			
Drainage patterns	<i>GCP A.5.b.1</i>			
Slopes after major grading	<i>GCP A.5.b.1</i>			
Calculations for storm water run-on	<i>GCP A.5.b.1</i>			
BMPs that divert off-site drainage from going through site	<i>GCP A.5.b.1</i>			
<i>Storm Water Inlets (graphic)</i>	<i>GCP A.5.b.2</i>			
Drainage patterns to storm water inlets or receiving water	<i>GCP A.5.b.2</i>			
BMPs that protect storm water inlets or receiving water	<i>GCP A.5.b.2</i>			
<i>Site History/Past Site Usage (Real Estate Broker Disclosure may be sufficient)</i>	<i>GCP A.5.b.3</i>			
Description of toxic materials treated, stored, or spilled on site	<i>GCP A.5.b.3</i>			
BMPs that minimize contact of contaminants with storm water	<i>GCP A.5.b.3</i>			
<i>Location of Areas Designated for: (graphic)</i>	<i>GCP A.5.b.4</i>			

(1) Reference Document Legend: GCP = General Construction Permit; MP = Municipal Permit; CSWSM = City Storm Water Standards Manual

(2) Indicate the page number where the information is located in your SWPPP. If the information is not applicable to your site, construction activities, or construction materials, check the N/A box. Your SWPPP does not have to address items which are not applicable to your situation.

(3) Date that the BMP will be installed on the site

Construction SWPPP Required Element	Reference Document and Section (1)	Page Number (2)	Not Applicable N/A	Implementation Date (3)
Soil or waste storage	<i>GCP A.5.b.4</i>			
Vehicle storage & service	<i>GCP A.5.b.4</i>			
Construction material loading, unloading, and access	<i>GCP A.5.b.4</i>			
Equipment storage, cleaning, maintenance	<i>GCP A.5.b.4</i>			
<i>BMP Descriptions for: (graphic or narrative)</i>	<i>GCP A.5.b.5</i>			
Waste handling and disposal areas	<i>GCP A.5.b.5</i>			
On-site storage and disposal of construction materials and waste	<i>GCP A.5.b.5</i>			
BMPs to minimize exposure of storm water to construction materials, equipment, vehicles, waste	<i>GCP A.5.b.5</i>			
<i>Post Construction BMPs</i>	<i>GCP A.5.b.6</i> <i>See A. 10</i>			
<i>Additional Information</i>	<i>GCP A.5. c</i>			
Description of other pollutant sources and BMPs that cannot be shown graphically	<i>GCP A.5.c.1</i>			
Pre-construction control practices	<i>GCP A.5.c.1</i>			
Inventory of materials and activities that may pollute storm water	<i>GCP A.5.c.2</i>			
BMPs to reduce/eliminate potential pollutants listed in the inventory	<i>GCP A.5.c.2</i>			
Runoff coefficient (before & after)	<i>GCP A.5.c.3</i>			
Percent impervious (before & after)	<i>GCP A.5.c.3</i>			
Copy of the NOI and WDID #	<i>GCP A.5.c.4</i>			
Construction activity schedule	<i>GCP A.5.c.5</i>			
Contact information	<i>GCP A.5.c.6</i>			
EROSION CONTROL	<i>GCP A.6</i>			
<i>The SWPPP shall include: (graphic)</i>	<i>GCP A.6.a-c</i>			
Areas of vegetation on site	<i>GCP A.6.a.1</i>			
Areas of soil disturbance that will be stabilized during rainy season	<i>GCP A.6.a.2</i>			
Areas of soil disturbance which will be exposed during any part of the rainy season	<i>GCP A.6.a.3</i>			
Construction phase / BMP sequencing schedule including supplemental pre-rain action plan for erosion control measures	<i>GCP A.6.a.4</i>			
BMPs for erosion control	<i>GCP A.6.b</i>			

(1) Reference Document Legend: GCP = General Construction Permit; MP = Municipal Permit; CSWSM = City Storm Water Standards Manual

(2) Indicate the page number where the information is located in your SWPPP. If the information is not applicable to your site, construction activities, or construction materials, check the N/A box. Your SWPPP does not have to address items which are not applicable to your situation.

(3) Date that the BMP will be installed on the site

Construction SWPPP Required Element	Reference Document and Section (1)	Page Number (2)	Not Applicable N/A	Implementation Date (3)
BMPs to control wind erosion	GCP A.6.c			
SEDIMENT CONTROL	GCP A.8			
Description/Illustration of BMPs to prevent increase of sediment load in discharge	GCP A.8			
Construction phase / BMP sequencing schedule including supplemental pre-rain action plan for sediment control measures	GCP A.8			
NON-STORM WATER	GCP A.9			
Description of non-storm water discharges to receiving waters	GCP A.9			
Locations of discharges	GCP A.9			
Description of BMPs	GCP A.9			
Name and phone number of qualified person responsible for non-storm water management	GCP A.9			
POST-CONSTRUCTION	GCP A.10			
Description and location of BMPs	GCP A.10			
Operation/Maintenance of BMPs after project completion (including funding)	GCP A.10			
MAINTENANCE, INSPECTIONS, AND REPAIR	GCP A.11			
Name and phone number of qualified person responsible for inspections	GCP A.11			
Inspection checklist: date, weather, inadequate BMPs, visual observations of BMPs, corrective action, inspector's name, title, signature	GCP A.11.a-f			
OTHER REQUIREMENTS	GCP A.12-16			
Documentation of all training	GCP A.12			
List of Contractors/Subcontractors	GCP A.13			
GCP Section B. Monitoring and Reporting Requirements				
Description of site inspection plans	GCP B.3			
Compliance certification (annually 7/1) if project is under active construction	GCP B.4			
Noncompliance reporting	GCP B.5			
Records of all inspections; compliance certifications; noncompliance reports, etc.	GCP B.6			

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(2) Indicate the page number where the information is located in your SWPPP. If the information is not applicable to your site, construction activities, or construction materials, check the N/A box. Your SWPPP does not have to address items which are not applicable to your situation.

(3) Date that the BMP will be installed on the site

Construction SWPPP Required Element	Reference Document and Section (1)	Page Number (2)	Not Applicable N/A	Implementation Date (3)
Monitoring program for sediment contribution from direct discharges to impaired water bodies	GCP B.7			
Monitoring program for pollutants not visually detectable in storm water (nonvisible pollutants)	GCP B.8			
GCP Section C. Standard Provisions for Construction Activities				
Signed Certification for SWPPP, reports, amendments, etc. Who is authorized to sign and by what authority has the duly authorized representative been assigned?	GCP C.9,10			
Location of General Permit and SWPPP on site during construction activities	GCP C. 17			
MP Section D.2 Construction Component				
GENERAL SITE MANAGEMENT	MP D.2.c.(1)(a)			
Pollution prevention, where appropriate	MP D.2.c.(1)(a)i. and CSWSM 3.3.2			
Development and implementation of a storm water site management plan	MP D.2.c.(1)(a)ii. and CSWSM 3.3.6			
Minimization of areas that are cleared and graded to only the portion of the site that is necessary for construction	MP D.2.c.(1)(a)iii. and CSWSM 3.3.6.1			
Minimization of exposure time of disturbed soil areas	MP D.2.c (1)(a)iv. and CSWSM 3.3.6.1			
Minimization of grading during the wet season and correlation of grading with seasonal dry weather periods to the extent feasible	MP D.2.c.(1)(a)v. and CSWSM 3.3.6.1			
Limitation of grading to a maximum disturbed area of 50 acres	MP D.2.c.(1)(a)vi. and CSWSM 3.3.8			
Temporary stabilization and reseeded of disturbed soil areas as rapidly as feasible	MP D.2.c.(1)(a)vii. and CSWSM 3.3.6.1			
Preservation of natural hydrologic features where feasible;	MP D.2.c. (1)(a)viii. and CSWSM 3.3.6			
Preservation of riparian buffers and corridors where feasible	MP D.2.c.(1)(a)ix. and CSWSM 3.3.6			
Maintenance of all BMPs, until removed	MP D.2.c.(1)(a)x. and CSWSM 3.3.6			
Retention, reduction, and proper management of all pollutant discharges on site to	MP D.2.c.(1)(a)xi. and			

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(3) Date that the BMP will be installed on the site

Construction SWPPP Required Element	Reference Document and Section (1)	Page Number (2)	Not Applicable N/A	Implementation Date (3)
the MEP standard	CSWSM 3.3.6			
EROSION AND SEDIMENT CONTROLS	MP D.2.c.(1)(b) and CSWSM 3.3.3			
Erosion prevention, to be used as the most important measure for keeping sediment on site during construction, but never as the single method	MP D.2.c.(1)(b)i. and CSWSM 3.3.3			
Sediment controls, to be used as a supplement to erosion prevention for keeping sediment on-site during construction	MP D.2.c.(1)(b)ii. and CSWSM 3.3.3			
Slope stabilization on all inactive slopes during the rainy season and during rain events in the dry season	MP D.2.c (1)(b)iii. and CSWSM 3.3.6.1&2			
Slope stabilization on all active slopes during rain events regardless of the season	MP D.2.c (1)(b)iv. and CSWSM 3.3.6.1			
Permanent re-vegetation or landscaping as early as feasible.	MP D.2.c.(1)(b)v. and CSWSM 3.3.6			
ADVANCED TREATMENT CONTROLS Addition of advanced treatment controls for projects that are determined to be an exceptional threat to water quality	MP D.2.c.(2) and CSWSM 3.3.9			
Operations and Maintenance Schedule	CSWSM 3.3.9			
Advanced treatment Monitoring Plan	CSWSM 3.3.9			
Advanced Treatment Training Plan	CSWSM 3.3.9			
Alternative Source Control Procedures in Lieu of Advanced Treatment Control Noted on Plans	CSWSM 3.3.9			
YEAR ROUND BMP IMPLEMENTATION	MP D.2.c.(3) and CSWSM 3.3.6			
Plan for year round implementation of minimum BMPs that can vary based upon wet and dry seasons	MP D.2.c.(3) and CSWSM 3.3.6			
ADDITIONAL CONTROLS FOR SITES TRIBUTARY TO CWA SECTION 303(d) IMPAIRED WATERS	MP D.2.c.(4) and CSWSM 3.3.7			
Maintain vegetative cover as much as possible by developing the project in a phased approach to reduce the amount of exposed soil at any one time.	CSWSM 3.3.7			
Limit the areas of active construction to five acres at any one time.	CSWSM 3.3.7			

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(2) Indicate the page number where the information is located in your SWPPP. If the information is not applicable to your site, construction activities, or construction materials, check the N/A box. Your SWPPP does not have to address items which are not applicable to your situation.

(3) Date that the BMP will be installed on the site

Construction SWPPP Required Element	Reference Document and Section (1)	Page Number (2)	Not Applicable N/A	Implementation Date (3)
Provide 100 percent soil cover for all areas of inactive construction throughout the entire time of construction, on a year-round basis.	CSWSM 3.3.7			
Provide appropriate perimeter control at all appropriate locations along the site perimeter and at all inlets to the storm drain system at all times during the rainy season	CSWSM 3.3.7			
Provide vegetated buffer strips between the active construction area and any water bodies.	CSWSM 3.3.7			
Provide stabilized construction entrances and limit all vehicle and foot traffic to those entrances.	CSWSM 3.3.7			
INSPECTION OF CONSTRUCTION SITE	MP D.2.d and CSWSM 3.4.3			
Inspection priority determined for site and frequency noted in SWPPP	MP D.2.d and CSWSM 3.4.3			
STANDARD STORM WATER POLLUTION PREVENTION NOTES	CSWSM 3.3.10			
Standard Storm Water Pollution Prevention Notes included on Grading Plans	CSWSM 3.3.10			

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(2) Indicate the page number where the information is located in your SWPPP. If the information is not applicable to your site, construction activities, or construction materials, check the N/A box. Your SWPPP does not have to address items which are not applicable to your situation.

(3) Date that the BMP will be installed on the site

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Appendix E

TIER 3 Construction SWPPP Checklist (CASQA Format)



TIER 3 CONSTRUCTION SWPPP CASQA FORMAT CHECKLIST

Project Name _____

Planchecker _____

Project ID _____

Date _____

CASQA Section Number and Potential Required Elements	Required for Project	Planchecker Verification
General Formatting		
Tabbed separators included between Sections		
Section - 100 SWPPP Certifications and Approval		
100.1 - SWPPP Certification by Preparer		
Project name, grading permit, building permit, discretionary permit number(s), APN at top of form		
Certification signed and dated by person responsible for preparation of the SWPPP		
Name, title and telephone number of the person signing the form		
SWPPP and Monitoring Program Checklist in Attachment L completed		
Notice of Intent (NOI) attached, completed and signed by Owner or Owner's agent		
100.2 - Owner Approval and Certification of SWPPP		
Project name, grading permit, building permit, discretionary permit number(s), APN at top of form		
Certification signed and dated by owners staff; specifically, the person responsible for preparation of the SWPPP and/or the person responsible for overall management of the site		
Name, title and telephone number of the person signing the form		
100.3 - Annual Compliance Certification		
Blank copy of the Annual Compliance of Compliance included as Attachment M		
Section 200 – SWPPP Amendments		
200.1 - SWPPP Amendment Certification and Approval		
Instructions and Blank Amendment Certification and Approval forms included		
200.2 - Amendment Log		
Instructions and Blank Amendment Log included		
Section 300 - Introduction and Project Description		
300.1 – Introduction and Project Description		
Projects legal description including County, City and address, proximity to receiving waters to which project will discharge including surface waters, drainage channels, and drainage systems; ownership of all drainage systems to which the project discharges		
300.2 – Unique Site Features		
Description of unique site features (water bodies, wetlands, environmentally sensitive areas, endangered or protected species, etc) and significant or high risk construction activities that may impact storm water quality. Include any		

unique features or activities within or adjacent to water bodies		
300.3 - Construction Site Estimates		
Construction site area in acres		
Runoff coefficient and percentage impervious area before and after construction		
Calculations for Coefficient change included in Attachment D		
Anticipated storm water run-on to the construction site		
Calculations for storm water run-on included in Attachment E		
300.4 - Project Schedule/Water Pollution Control Schedule		
Written and geographical project schedule including:		
Project start and finish dates		
Rainy season dates		
Annual certifications		
Mobilization dates		
Mass clearing and grubbing/roadside clearing dates		
Major grading/excavation dates		
Special dates named in other permits such as Fish and Game and Army Corps of Engineers Permits		
Dates for submittal of SWPPP Amendments required by the contract documents		
Annual submittal of rainy season implementation schedule if required by the Owner or Permittee		
Dates for implementation of pre-rainy season temporary soil stabilization and temporary sediment control BMPs, if required		
Rainy season implementation schedule including:		
Deployment of temporary soil stabilization BMPs		
Deployment of temporary sediment control BMPs		
Deployment of wind erosion control Bmps		
Deployment of tracking control BMPs		
Deployment of non-storm water BMPs		
Deployment of waste management and materials pollution control BMPs		
Non-rainy season implementation schedule		
Deployment of temporary soil stabilization BMPs		
Deployment of temporary sediment control BMPs		
Deployment of wind erosion control Bmps		
Deployment of tracking control BMPs		
Deployment of non-storm water BMPs		
Deployment of waste management and materials pollution control BMPs		
Paving, saw-cutting and any other pavement related operations		
Major planned stockpiling operations		

Dates for other significant long-term operations or activities that may plan non-storm water discharges such as dewatering, grinding, etc		
Final stabilization activities staged over time for each area of the project		
300.5 - Contact Information/List of Responsible Parties		
Name and telephone number(s) of the Contractor's Storm Water Pollution Prevention Manager (SWPPM) and required text		
Section 400 - References		
List of documents referenced in the SWPPP		
All Federal, State and City permits		
On-site project information including plans and specifications, geotechnical report(s), hydrology/hydraulic report(s), and other reports and regulatory guidance documents		
Each referenced document includes title, number (if applicable), author, date published and revision date		
Section 500 – Body of SWPPP		
500.1 - Objectives		
Required text included		
500.2 – Vicinity Map		
8 ½' x 11" color copy of USGS map or equal included as Attachment A displaying site perimeter, major roadways, geographic features and landmarks, adjacent water bodies, known wells, an outline of the off-site drainage area, anticipated discharge locations and general topography		
Brief narrative description of the vicinity map		
500.3 – Pollutant Source Identification and BMP Selection		
Required text included for each subsection		
500.3.1 – Inventory of Materials and Activities that May Pollute Storm Water		
List of all construction materials that have the potential to contribute to the discharge of pollutants to storm water and required text		
List of all construction activities that have the potential to contribute sediment to storm water discharges		
500.3.2 – Existing Pre-construction Control Measures		
List of any existing BMPs in place prior to construction used to reduce erosion, sediment or other pollutants in storm water discharges		
500.3.3 Nature of Fill Material and Existing Data Describing the Soil		
Description of the conditions of the fill materials and soils at the construction site including soil types, groundwater location and condition, dewatering operations, presence of existing toxic materials and contaminants and other relevant information		
500.3.4 Erosion Control (EC) (Soil Stabilization)		
Attachment C included. BMP Consideration Checklist filled out. Appropriate EC BMPs selected		
Introductory paragraphs the define EC and give general approach on how temporary EC BMPs will be implemented		

List all temporary EC BMPs to be used on the project		
Show temporary EC BMPs on the Water Pollution Control Drawings (WPCDs)		
Provide narrative description of temporary EC BMPs that cannot be adequately identified on the WPCDs		
Discussion of on-site availability of temporary EC materials and proposed mobilization and implementation of temporary EC BMPs in event of predicted rain. Explanation of how and when BMPs will be implemented when rain is forecasted		
Additional City Required Erosion Control Requirements		
Erosion prevention, to be used as the most important measure for keeping sediment on site during construction, but never as the single method		
Sediment controls, to be used as a supplement to erosion prevention for keeping sediment on-site during construction		
Slope stabilization on all inactive slopes during the rainy season and during rain events in the dry season		
Slope stabilization on all active slopes during rain events regardless of the season		
Permanent revegetation or landscaping as early as feasible.		
500.3.5 – Sediment Control (SC)		
Attachment C included. BMP Consideration Checklist filled out. Appropriate SC BMPs selected		
List all temporary SC BMPs to be used on the project		
Show temporary SC BMPs on the Water Pollution Control Drawings (WPCDs)		
Provide narrative description of temporary SC BMPs that cannot be adequately identified on the WPCDs		
BMPs used to divert off-site drainage around and/or through the construction site shown on WPCDs		
Discussion of on-site availability of temporary EC materials and proposed mobilization and implementation of temporary EC BMPs in event of predicted rain		
500.3.6 Tracking Control (TC)		
Attachment C included. BMP Consideration Checklist filled out. Appropriate TC BMPs selected		
List all temporary TC BMPs to be used on the project		
Show all ingress/egress points to project site on WPCDs and show or describe TC BMPs		
Provide narrative description of temporary TC BMPs that cannot be adequately identified on the WPCDs		
Discussion of road cleaning BMPs		
500.3.7 Wind Erosion Control (WEC)		
Attachment C included. BMP Consideration Checklist filled out. Appropriate WEC BMPs selected		
Narrative description of WEC BMPs to be used on project		
500.3.8 – Non-Storm Water Control (NSWC)		
All potential non-storm water discharges listed		
Attachment C included. BMP Consideration Checklist filled out. Appropriate NSWC BMPs selected		
Discuss how mobile operations, such as equipment maintenance and fueling, will be addressed		
Describe each planned NSW discharge from project including flow/quantity. If flow/quantity cannot be determined,		

then describe nature and extent of activity so quantity can be inferred		
Show NSWC BMPs on WPCDs and/or provide narrative description including path of discharge to storm inlet, drainage facilities or receiving waters		
Describe time period and frequency of each NSW activity that generates or may generate a discharge		
Describe mandatory NSWC BMPs and practices required by City , State or Federal agencies and provide details and schedules as appropriate. Include maintenance, inspection, testing and reporting procedures, if applicable. Include permit info for discharges covered by separate NPDES permit		
Describe selected NSWC BMPs and practices to minimize, contain and dispose of prohibited discharges. Include maintenance, inspection, testing and reporting procedures, if applicable		
Describe sediment controls for landscape irrigation run-off prior to establishment of vegetation		
Indicate how illicit connections and illegal discharges will be handled.		
Develop new owner notification pamphlet to make new owner aware of potential for unauthorized discharges and practices, if needed		
500.3.9 – Waste Management and Material Pollution Control (WMMPC)		
All potential WMMP activities listed		
Attachment C included. BMP Consideration Checklist filled out. Appropriate WMMPC BMPs selected		
Substitute safer, less polluting products where possible		
List selected WMMPC BMPs and describe proposed facilities for materials storage and waste management. Include schedules, inspection and maintenance requirements. Show on WPCDs as appropriate		
Describe proposed waste collection and removal schedule		
500.3.10 – Cost Breakdown for Water Pollution Control		
Water pollution control cost estimate sheet included		
Additional City Requirements		
Advanced Treatment Controls (If required. See Storm Water Standards Manual Section 3.3.9)		
Operations and Maintenance Schedule		
Advanced treatment Monitoring Plan		
Advanced Treatment Training Plan		
Alternative Source Control Procedures in Lieu of Advanced Treatment Control Noted on Plans		
Year Round BMP Implementation		
Plan for year round implementation of minimum BMPs that can vary based upon wet and dry seasons		
Additional Controls for Sites tributary to CWA Section 303(d) Impaired Waters RS		
Maintain vegetative cover as much as possible by developing the project in a phased approach to reduce the amount of exposed soil at any one time.		
Limit the areas of active construction to five acres at any one time.		
Provide 100 percent soil cover for all areas of inactive construction throughout the entire time of construction, on a year-round basis.		

Provide appropriate perimeter control at all appropriate locations along the site perimeter and at all inlets to the storm drain system at all times during the rainy season		
Provide vegetated buffer strips between the active construction area and any water bodies.		
Provide stabilized construction entrances and limit all vehicle and foot traffic to those entrances.		
Inspection of Construction Site		
Inspection priority determined for site and frequency noted in SWPPP		
City Standard Storm Water Pollution Prevention Notes		
Standard Storm Water Pollution Prevention Notes included on Grading Plans		
500.4 – Water Pollution Control Drawings (WPCDs)		
WPCDs included as Attachment B		
Cover sheet listing BMPs that will be used and any selected options shown on fact sheets, along with construction notes and a legend		
All BMPs that can be shown are shown where appropriate on WPCDs		
BMP details included with WPCDs and appropriate CASQA and other standard references included		
Additional details shown as necessary to describe site specific BMP applications		
Grading sheets, drainage sheets or erosion control sheets used as base sheets for WPCDs.		
Base sheet details required:		
site perimeter		
Existing and proposed buildings, lots and roadways		
Permanent post construction BMPs		
Storm water collection and discharge points		
General topography before and after construction; anticipated discharge location(s)		
Tributary areas and drainage patterns to each on-site storm water inlet		
Receiving water or discharge point; off-site tributary drainage areas; temporary on-site drainage(s) to carry concentrated flows		
Outline of areas of existing vegetation; soil cover or native vegetation that will remain undisturbed		
Areas of cut and fill		
Outlines of areas of soil disturbance		
Locations of known toxic spills and discharges or contaminated soils		
Locations of potential non-storm water discharges such as dewatering operations, concrete saw cutting or coring, pressure washing, waterline flushing, diversions, cofferdams and vehicle equipment cleaning		
Locations of direct discharge into a Section 303(d) listed water body		
Sampling locations		
Ingress and egress points		
Temporary stockpiles		

Vehicle and equipment storage, fueling, maintenance and cleaning; and, phasing and/or construction staging		
BMPs for waste management and materials pollution control		
Show all storage, staging, borrow sites, stockpile sites, access roads, lay down areas and other non-development construction areas where construction activity will occur including contractors yard if in vicinity		
All contractor phasing and/or construction staging reflected on WPCDs for full scope of project		
500.5 – Construction BMP Maintenance, Inspection and Repair		
Description of program to maintain all construction BMPs		
Complete maintenance, inspection and repair program included as Attachment G		
500.6 – Post-Construction Storm Water Management		
500.6.1 Post-Construction Control Practices		
Describe the construction BMPs employed after all construction phases have been completed including their operation and maintenance after project completion		
For projects that require a Storm Water Management Plan (SWMP), the City SWMP identification number shall be referenced		
500.6.2 – Operation/Maintenance after Project Completion		
Description of any operations and maintenance requirements of post-construction control practices		
List parties responsible for long term operation and maintenance of permanent BMPs		
500.7 - Training		
Description of storm water pollution prevention training that contractor's inspection, maintenance and repair personnel have received		
Storm Water Pollution Prevention Manger (SWPPM) has a minimum of 24 hours training		
Document formal and informal storm water training on Trained Contractor Personnel Log Sheet included as Attachment I		
List of classes and copies of class completion documents may be submitted		
500.8 – List of Subcontractors		
List of subcontractors and individuals responsible for implementation of the SWPPP including telephone numbers and addresses included as Attachment J		
Section 600 – Monitoring Program and Reports		
600.1 – Site Inspections		
Required text included		
600.2 – Non-Compliance Reporting		
Required text included		
Sample Notice of Compliance form included as Attachment K		
Sample logging discharges form included as Attachment T		
600.3 – Record Keeping and Reports		
Required text included		

600.4 – Sampling and Analysis Plan for Sediment (for projects discharging to 303(d) waters)		
Required text included		
Describe if project discharges to 303(d) waters		
600.4.1 – Scope of Monitoring Activities		
List the impaired 303(d) water body and reason for impairment		
Describe the location(s) of direct discharge to each 303(d) listed water body		
Required text included		
600.4.2 – Monitoring Strategy		
Required text included		
Description of sampling schedule for monitoring impacts of direct discharges		
Description of sampling locations		
Description of rationale for selection of sampling location		
Identification of upstream location for sampling including GPS coordinates		
Identification of downstream location for sampling including GPS coordinates		
Include sampling location for run-on location if one exists		
Describe surrounding areas that may contribute to run-on sediment to site		
Sampling locations not located near point sources or confluences		
Sampling locations not located directly downstream from bridge or road surface run-off		
600.4.3 – Monitoring Preparation		
Identify sampling personnel including company name		
Describe training and qualifications of sampling personnel		
Identify contractors health and safety procedures for sampling personnel		
Identify alternate sampling personnel		
Identify state certified laboratory to analyze samples		
Describe strategy for ensuring adequate sample supplies are available prior to sampling		
Describe strategy for ensuring appropriate field testing equipment is available prior to sampling		
600.4.4 – Sample Collection and Handling		
Description of sample collection procedures		
Sample procedure in accordance with test procedure under 40 CFR Part 136		
Description of sample handling procedures		
Description of decontamination waste disposal requirements		
Description of sample collection documentation procedures		
Description of procedures for recording and correcting sampling data		
Chain of custody form required to be submitted to laboratory with samples		
Sampling activity log to be kept to document details of all sampling events		
Each sample bottle required to have proper and complete identification label		

600.4.5 – Sample Analysis		
Describe tests to be used on project samples using “Sample Collection, Preservation and Analysis for Monitoring Sedimentation/Siltation and/or Turbidity” form		
Appropriate answers included on form for discharges to 303(d) listed waters		
All appropriate blank fields on form filled in		
600.4.6 – Quality Assurance/Quality Control		
Required text included		
600.4.7 – Data Management and Reporting		
Required text included		
600.4.8 – Data Evaluation		
Required text included		
600.4.9 – Change of Conditions		
Required text included		
600.5 – Sampling and Analysis Plan for Non-Visible Pollutants		
Required text included		
600.5.1 – Scope of Monitoring Activities		
Required text included		
Identify general sources and locations of potential non-visible pollutants on project site for:		
Materials or wastes identified in Section 500.3.1		
Materials or wastes that are stored under watertight conditions		
Construction activities such as application of fertilizers, pesticides, herbicides etc that have occurred during a rain event of with 24 hours preceding a rain event		
Existing site features contaminated with non-visible pollutants		
Application of soil amendments and other chemicals with the potential to alter PH levels or contribute toxic pollutants to storm water runoff		
Storm water runoff from an area contaminated by historical usage of the site		
Storm water run-on to the project site with potential to contribute pollutants		
Breaches, malfunctions, leakages or spills from a BMP		
600.5.2 - Monitoring Strategy		
Required text included		
Description of sampling schedule		
Describe locations for sampling locations		
Description for rationale for selection sampling locations		
Sampling locations selected from each source of non-visible pollutants identified in Section 600.5.1		
Description of location for collecting uncontaminated background sample		
Description of location for sampling storm water run-on from each location identified in Section 600.5.1		

Description of sampling locationat off-site activities related to the project		
Sampling locations in areas that are safe, out of the path of heavy traffic and have attainable access		
List and describe surrounding sites and uses that may contribute run-on or airborne constituents to the site		
600.5.3 – Monitoring Preparation		
Identify party responsible for sample collection		
Describe training and qualifications of sampling personnel		
Identify contractors health and safety procedures for sampling personnel		
Identify alternate sampling personnel		
Identify state certified laboratory to analyze samples		
Describe strategy for ensuring adequate sample supplies are available prior to sampling		
Describe strategy for ensuring appropriate field testing equipment is available prior to sampling		
600.5.4 – Analytical Constituents		
Table 600-2 to be completed and attached		
List of non-visible pollutant source, non-visible pollutant name and water quality indicator		
Construction Material and Pollutant Testing Guidance Table – Non-Visible Pollutants table completed and attached		
Visible pollutants not added to table		
Table 600-3 completed and attached		
600.5.5 – Sample Collection and Handling		
Laboratory analysis, sampling, sample preservation and analyses conducted according to test procedures under 40 CFR Part 136		
Chain of custody form required to be submitted to laboratory with samples		
Sampling activity log to be kept to document details of all sampling events		
Each sample bottle required to have proper and complete identification label		
Description of sample collection procedures		
Description of sample handling procedures		
Description of decontamination waste disposal requirements		
Description of sample collection documentation procedures		
Description of procedures for recording and correcting sampling data		
Table 600-3 to be completed		
600.5.6 – Sample analysis		
Table 600-2 to be completed and attached		
Table 600-3 to be completed and attached		
Test method included for each non-visible pollutant identified in Table 600-2		
Procedure to contact laboratory for appropriate test method(s)/specification to be used for each constituent		
Field test instruments to be used for sampling identified		
600.5.7 – Quality Assurance/Quality Control		

Required text included		
600.5.8 – Data Management and Reporting		
Required text included		
600.5.9 Data Evaluation		
Required text included		
600.5.10 – Change of Conditions		
Required text included		

Appendix F

Tier 2 Construction SWPPP Template



Tier 2 Construction SWPPP Preparation Template

This document has been prepared to identify the various components that make up a Tier 2 Construction Storm Water Pollution Prevention Plan (SWPPP). A complete Tier 2 Construction SWPPP is composed of the following components:

1. A set of storm water pollution plan drawings meeting all the requirements of the Construction SWPPP Checklist items as contained in the Tier 2 Construction SWPPP Review Checklist attached as Appendix G to Section 3 (Construction SWPPP Standards and Requirements) in the City Storm Water Standards Manual.
2. A completed and signed Storm Water Compliance Form for a Tier 2 Construction SWPPP as contained in Appendix B to Section 3 (Construction SWPPP Standards and Requirements) in the City Storm Water Standards Manual.
3. A completed and signed Tier 2 Construction SWPPP Site Assessment Form (attached)
4. All supporting documentation, studies and reports as required to comply with the Municipal Permit and City Standards including any needed hydrology and hydraulic calculations, soils and geotechnical reports, spill prevention plan and manufacturers information and other data needed to clarify and support of the proposed storm water pollution prevention plan.

Included with this template is a Tier 2 Construction SWPPP Required Elements Checklist that should be used by the qualified Construction SWPPP preparer during the preparation of the plan to ensure that all required elements are included into the plan.



Tier 2 Construction SWPPP Site Assessment Form

Project ID: _____

Project Information:

Project Name: _____

Project Address/Location; _____

Responsible Parties/Contact Information:

Name of Preparer: _____

Qualification of Preparer (Registration/Certification): _____

Address: _____

City/State/Zip Code: _____

Phone Number: _____

Name of Owner/Owner's Agent: _____

Address: _____

City/State/Zip Code: _____

Phone Number: _____

Name of Emergency Contact: _____
(during construction)

Address: _____

City/State/Zip Code: _____

Phone Number: _____

Site and Construction Activity Description:

Construction Start Date: _____ End Date: _____

If work begins in rainy season or extends into rainy season, explain how project work can be scheduled can be altered to avoid rainy season impacts or to lessen exposure of site during rainy season: _____

Grading Quantities: Cut: _____CY; Fill: _____CY; Import: _____CY;
Export: _____CY

Any Stockpile Proposed? _____ If yes, then estimate quantity: _____CY

Estimated duration of stockpile: _____Months

Soils types: _____

Does site contain a preponderance of soils with USDA-NRCS erosion factor kf greater than or equal to 0.4? _____

Is a staging area proposed (yes/no)? _____

If yes, then where is it located? _____

Is concrete washout required (yes/no)? _____

Where is it located? _____

Any existing site contamination (yes/no)? _____

Where is it located? _____

Any vehicle storage, maintenance or fueling area proposed (yes/no)? _____

Where is it located? _____

Any de-watering operation proposed (yes/no)? _____

Where is it located? _____

Any other special operations proposed that may impair water quality (yes/no)? _____

What and where? _____

List materials that will be used on construction site and their handling and storage requirements

Material	Characteristics/Toxicity	Handling requirements

If any toxic or hazardous materials are proposed, then a spill prevention plan is required. Is a spill prevention plan required (yes/no)? _____.

If yes, attach spill prevention plan.

Perceived Threat to Storm Water Quality rating:

Using the Construction Threat Assessment Worksheet (attached as Appendix C to Section 3 (Construction SWPPP Standards and Requirements) of the City Storm Water Standards Manual, determine the projects Perceived Threat to Storm Water Quality rating.

The Construction Threat to Storm Water Quality rating for this project is: ☐ High ☐ Medium

Signature of Plan Preparer:

Signature: _____ Date: _____

Print Name: _____ Title: _____

Attachments:

- ☐ Storm Water Compliance Form – Tier 2
- ☐ Spill Prevention Plan
- ☐ Hydrology and/or hydraulic study
- ☐ Solis and/or geotechnical report(s)
- ☐ Other. List: _____

BMP Selection:

The following tables are provided to help identify and select appropriate site specific BMPs for the proposed project. Review the list of potential site construction activities and site conditions described along the left hand column of each sheet. Then, for each activity or site condition that is included in the proposed project, pick one or more of the BMPs described at the top of the form and place an X(s) in the box(es) that form(s) an intersection between the activity/site condition row and BMP column(s).

All structural (physical facility) BMP's should be shown on the site plan in the Construction SWPPP drawing set. Any proposed no-structural BMP should be noted in the Special Notes on the Construction SWPPP drawing set.

	Erosion Control BMPs													Wind Erosion BMPs
BMP Description →	Scheduling	Preservation of Existing Vegetation	Hydraulic Mulch	Hydroseeding	Soil Binders	Straw Mulch	Geotextiles & Mats	Wood Mulching	Earth Dikes and Drainage Swales	Velocity Dissipation	Slope Drains	Streambank Stabilization	Polyacrylamide	Wind Erosion Control
CASQA Designation →	EC-1	EC-2	EC-3	EC-4	EC-5	EC-6	EC-7	EC-8	EC-9	EC-10	EC-11	EC-12	EC-13	WE-1
Construction Activity or Site Condition														
Cleared Areas														
Flat pad graded areas														
Graded slope areas														
Trenching/Excavation														
Stockpiling														
Drilling/Boring														
Conduit/Pipe Installation														
Substructure/Pad Installation														
Staging Area														
Existing onsite vegetated areas														
Drainage flow onto site														
Drainage flows off of site														
Drainage at top of slope														
Other (list):														

[illegible]

	Tracking Control BMPs		
BMP Description →	Stabilized Construction Ingress/Egress	Stabilized Construction Roadway	Ingress/Egress Tire Wash
CASQA Designation → Construction Activity v	TR-1	TR-2	TR-3
Site Access point(s)			
Staging area access point(s)			
Maintenance access roads to BMPs			
Other (list):			

	Non-Storm Water Management BMPs															
BMP Description →	Water Conservation Practices	Dewatering Operations	Paving and Grinding Operations	Temporary Stream Crossing	Clear Water Diversion	Illicit Connection/Discharge	Potable Water/Irrigation	Vehicle and Equipment Cleaning	Vehicle and Equipment Fueling	Vehicle and Equipment Maintenance	Pile Driving Operations	Concrete Curing	Concrete Finishing	Material and Equipment Use	Demolition Adjacent to Water	Temporary Batch Plants
CASQA Designation →	NS-1	NS-2	NS-3	NS-4	NS-5	NS-6	NS-7	NS-8	NS-9	NS-10	NS-11	NS-12	NS-13	NS-14	NS-15	NS-16
Construction Activity & Site Conditions																
Landscaping & Irrigation																
Drilling/Boring																
Concrete/Asphalt Sawcutting																
Concrete flatwork																
Paving																
Wire, Cable & Connector Installation																
Site Housekeeping																
Staging Area																
Equipment Maintenance and Fueling																
Hazardous Substance Management																
Dewatering																
Stream crossing																
Material delivery																
Solid waste handling including trash and debris removal																
Concrete or stucco work																
Other (list):																

[illegible]



Tier 2 Construction SWPPP Required Elements Checklist

Required Elements	Required for Project	Preparer Verification
Construction SWPPP Drawing Set		
1. Standard Storm Water Pollution Prevention Notes		
A. General Site Management Requirements Notes		
B. Rainy Season Site Management Requirements Notes		
C. Erosion Control Hydroseeding, Planting and Irrigation Notes		
D. Special site specific notes		
2. City SWMP identification number affixed for high priority projects		
3. Construction Threat to Storm Water Quality rating (high or medium inspection frequency required?)		
4. Regional Water Board WDID Number shall be affixed for small linear utility projects as appropriate		
5. Project Location		
6. Legend		
7. Description of work		
A. Quantities (cut, fill, import, export)		
B. Area of disturbance		
C. Site conditions description		
1) Soils type		
8. Benchmark Information		
9. Preparer's signature and seal as appropriate		
10. City title block		
11. Emergency contact name, company and phone number		
12. Water shed project drains to listed		
13. Site Plan		
A. Existing topographic and cultural features of site and immediate vicinity as appropriate		
B. Scale and north arrow		
C. Project boundary and property lines		
D. Proposed grading contours and slopes clearly shown		

E. Staging areas, equipment storage, refueling, stockpiling and maintenance areas identified		
F. Storm drain inlets, open channels and natural drainages and watercourses that flow onto or drain off of the project site clearly delineated		
G. Potential source points of pollutants (fueling locations, waste container areas, wash racks, hazardous materials storage, etc)		
H. Site access locations		
I. Proposed BMPs – location and description		
1) Perimeter controls		
2) Erosion controls		
3) Sediment controls		
4) Tracking controls		
5) Non-storm water management controls		
6) Waste management and materials pollution controls		
7) Additional controls (as needed)		
8) Advanced treatment methods (as needed)		
J. Toxic or hazardous material contamination or spill areas		
K. Existing site BMP installations		
14. BMP detail drawings as needed		
Construction SWPPP Supplemental Documentation		
1. Storm Water Compliance Form for a Tier 2 Construction SWPPP completed and signed		
2. Tier 2 Site Assessment Form completed and signed		
3. Hydrology and hydraulic calculations (as needed for sediment basins and sizing of drainage swales to handle drainage during construction)		
4. Soils report (as needed when proposed BMP installation may affect ground water, slope stability or other geotechnical site condition)		

Appendix G

Tier 2 Construction SWPPP Plan Review Checklist



Tier 2 Construction SWPPP Review Checklist

PROJECT ID NO. _____ PROJECT NAME _____
 PLANCHECKER _____ DRAWING NO. _____ DATE _____

	1st Chk	2nd Chk	3rd Chk	Mylar	Comments
I. CONSTRUCTION SWPPP DRAWING					
1. ALL SHEETS					
A. Medium (to be reviewed at time of submission of final plan check)					
1) 24"x36" mylar film with title block (Alternative medium may be approved by Deputy City Engineer or designee)					
2) No "sticky-back", glued or taped on or together sections					
3) Drawing with waterproof ink or photographically reproduced					
B. Drafting					
1) Signed by the Qualified SWPPP Preparer					
2) Marked with the name, address & telephone number of the Qualified SWPPP Preparer preparing the plan & date of preparation					
3) Consecutively numbered & the total number of sheets shown					
4) Lettered in a neat & legible style no lettering smaller than 1/8"					
5) Title with the name & discretionary permit number of the City approval					
6) Prepared to appropriate Scale(s)					
7) Drawn as separate plans from Grading Plans, Building Plans or Improvement Plans					
8) Use standard plans & details to maximum extent					
9) Clearly designate between existing conditions & work proposed					
10) Scale noted, north arrow & bar scale provided					
11) No duplication of any section or detail letter designation.					
2. TITLE SHEET					
A. Erosion Control Notes Provided					
1) Standard Notes					
2) Supplemental special notes					
B. Project Location					
1) Legal description					
2) Assessor's parcel number					
3) Vicinity map (may be waived by Deputy City Engineer or designee)					
C. Legend					
1) Symbols per County Standards					

	1st Chk	2nd Chk	3rd Chk	Mylar	Comments
2) Every symbol used on the plans is shown in the legend					
3) Every symbol description clear & unequivocal					
D. Description & Quantities of Work					
1) Quantities for each item constructed or installed per these plans					
2) Erosion control Structural BMPs					
3) Standard references listed					
E. Site Plan - (certain site plan requirements may be waived for projects not requiring a grading plan per the approval of the Deputy City Engineer or designee)					
1) Full project site area shown (on one sheet if possible)					
2) Adequate adjacent site area shown to clearly indicate drainage courses that flow onto or off of the site					
3) Topography extends minimum 15' beyond limits of work & over entire property					
4) Existing contours and cultural features (screened back – 60% matte)					
5) Proposed contours and cultural features					
6) Existing & proposed contours clearly differentiated					
7) Slope symbols used only on slopes 2:1 or steeper					
8) Degree of slope shown for all slopes					
9) Fill slopes shaded					
10) Proposed lot lines shown					
11) Existing lot lines shown & dimensioned					
12) Street name or designations					
F. Drainage Facilities and Water Courses					
1) Storm drains and inlets existing and proposed					
2) Water courses and natural drainages shown with arrows indicating direction of flow					
3) Down drains					
4) Paved swales & terrace drains shown with arrows indicating direction of flow					
5) Existing and proposed basins					
G. Detail Drawings (Only when necessary. Generally refer to CASQA reference drawings)					
1) Modifications to standard drawings (CASQA or others) should be detailed					
H. Proposed Storm Water BMPs					
1) BMPs shown in bold ink and clearly visible					
2) BMP notes and identifiers bolded and clearly shown					

	1st Chk	2nd Chk	3rd Chk	Mylar	Comments
3) Proper CASQA (or other standard) designations used					
4) Perimeter control shown					
a. Flows onto site contained or diverted around construction area					
b. Flows off-site mitigated through retention, dissipation or other means					
c. Perimeter silt fencing, fiber rolls or other sediment control BMP for sloped areas or areas of sheet flow					
5) Erosion control shown					
a. Existing vegetation preserved where possible					
b. BMP specified for all sloped areas 3:1 or steeper					
c. Minimize area and duration of exposed soils					
6) Sediment control shown					
a. Basin or other appropriate BMP shown for flat areas less than 3:1					
b. Onsite and offsite inlets protected with storm drain inlet protection, gravel bags or other appropriate BMP					
c. Onsite earth swales and water courses protected with check dams, gravel bags, fiber rolls or other appropriate BMP					
d. Additional controls proposed for sites draining directly to receiving waters					
7) Tracking control shown					
a. Limit vehicle and equipment access points onto site					
b. Stabilized construction entrance called out on plan					
8) Non-Storm Water Management BMP indicated on plan					
a. Vehicle and equipment fueling and maintenance areas identified and protected					
b. Concrete Finishing and curing protections					
9) Waste Management and Materials Control BMPs					
a. Material Delivery and Storage BMPs indicated					
b. Stockpile management BMPs indicated					
c. Concrete mixer wash out BMP indicated					
I. General Site Management					
1) All weather access provide to basins and other BMPs that require cleaning or maintenance during rainy season					

	1st Chk	2nd Chk	3rd Chk	Mylar	Comments
2) 24 hour telephone number for emergency erosion control person and name of specific individual with authority and responsibility for erosion control					
3) Schedule for completion of installation of erosion control facilities					
4) Erosion control planting & method of starting & maintaining growth (irrigation)					
5) "Weather triggered" action plan for deploying BMPs with 48 hours of a predicted rain					
6) Description of standby BMP materials plan					
J. Project Conditions of Approval (list if applicable.)					
1)					
2)					
3. ADDITIONAL PLAN SHEETS (Additional plan sheets as required to adequately depict required BMP details or depict the site plan with an appropriate scale to clearly show all existing and proposed features)					
II. SUPPLEMENTAL DOCUMENTATION					
1. STORM WATER COMPLIANCE FORM (properly filled out and signed by Owner or Owner's Agent including appropriate City approval initial)					
2. COMPLETED SITE ASSESSMENT FORM					
3. SPILL PREVENTION PLAN (as required)					
5. SOILS/GEOTECHNICAL INVESTIGATION REPORT (As needed for geotechnical safety. Follow format indicated on Grading Plan Checklist when required)					
6. CALCULATIONS (As needed for projects with sedimentation basins or significant on-site/off-site drainage flows to determine sizing of swales and potential for erosive velocities)					
A. All					
1) All pages numbered					
2) Total number of pages on each page					
3) Each page labeled with the name address & telephone number of the preparing firm					
4) Neat & legible					
5) Indexed					
6) In logical order					
7) Cross-referenced to plans					
8) Bound					
9) Sturdy cover					
10) Signed, sealed & dates of preparation and expiration of registration applied on report cover or on bound-in cover letter					
11) Cover prominently labeled with subject, name & number of the discretionary permit for the project.					

	1st Chk	2nd Chk	3rd Chk	Mylar	Comments
B. Hydrology Per San Diego County Standards					
1) 1984 rainfall intensity curves					
2) Appropriate value of C					
3) Appropriate design method					
a. U.S. Army Corps of Engineers HEC series					
b. Soil Conservation Service Unit Hydrography					
c. Rational Method (Q=CIA) (0.5 sq. mile max)					
4) Tl correctly completed					
5) If correctly completed					
6) Tc correct					
7) Six hour/24 intensities correctly balanced					
8) Documentation provided or "plain english" output for computer generated reports					
C. Hydraulic					
1) Documentation provided or "plain english" output for computer generated reports					
2) Clear copies provided or all charts, maps, nomographs or other graphic used					
3) Cite general formula before inserting specific values (i.e. $Q=AV$; $Q=2.5 \times 18 = 4.75$ cfs)					
7. ENGINEER'S ESTIMATE (Needed only for projects with grading plans. Follow grading plan checklist requirements)					

Additional Comments: _____

Appendix H

Tier 1 Construction SWPPP Standard Template

CITY OF CARLSBAD

STANDARD FORM - TIER 1 STORM WATER POLLUTION PREVENTION PLAN

STORM WATER COMPLIANCE CERTIFICATE

- ✓

My project is not in a category of permit types exempt from the Construction SWPPP requirements

✓

My project is not located inside or within 200 feet of an environmentally sensitive area with a significant potential for contributing pollutants to nearby receiving waters by way of storm water runoff or non-storm water discharge(s).

✓

My project does not requires a grading plan pursuant to the Carlsbad Grading Ordinance (Chapter 15.16 of the Carlsbad Municipal Code)

✓

My project will not result in 2,500 square feet or more of soils disturbance including any associated construction staging, stockpiling, pavement removal, equipment storage, refueling and maintenance areas that meets one or more of the additional following criteria:

•

located within 200 feet of an environmentally sensitive area or the Pacific Ocean; and/or,

•

disturbed area is located on a slope with a grade at or exceeding 5 horizontal to 1 vertical; and/or

•

disturbed area is located along or within 30 feet of a storm drain inlet, an open drainage channel or watercourse; and/or

•

construction will be initiated during the rainy season or will extend into the rainy season (Oct. 1 through April 30).
- I CERTIFY TO THE BEST OF MY KNOWLEDGE THAT ALL OF THE ABOVE CHECKED STATEMENTS ARE TRUE AND CORRECT. I AM SUBMITTING FOR CITY APPROVAL A TIER 1 CONSTRUCTION SWPPP PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF CITY STANDARDS.
- I UNDERSTAND AND ACKNOWLEDGE THAT I MUST: (1) IMPLEMENT BEST MANAGEMENT PRACTICES (BMPS) DURING CONSTRUCTION ACTIVITIES TO THE MAXIMUM EXTENT PRACTICABLE TO MINIMIZE THE MOBILIZATION OF POLLUTANTS SUCH AS SEDIMENT AND TO MINIMIZE THE EXPOSURE OF STORM WATER TO CONSTRUCTION RELATED POLLUTANTS; AND, (2) ADHERE TO, AND AT ALL TIMES, COMPLY WITH THIS CITY APPROVED TIER 1 CONSTRUCTION SWPPP THROUGHTOUT THE DURATION OF THE CONSTRUCTION ACTIVITIES UNTIL THE CONSTRUCTION WORK IS COMPLETE AND APPROVED BY THE CITY OF CARLSBAD.
- OWNER(S)/OWNER’S AGENT NAME (PRINT)
- OWNER(S)/OWNER’S AGENT NAME (SIGNATURE)
- DATE
- STORM WATER POLLUTION PREVENTION NOTES
1.

ALL NECESSARY EQUIPMENT AND MATERIALS SHALL BE AVAILABLE ON SITE TO FACILITATE RAPID INSTALLATION OF EROSION AND SEDIMENT CONTROL BMPS WHEN RAIN IS EMINENT.

2.

THE OWNER/CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY ENGINEER AFTER EACH RUN-OFF PRODUCING RAINFALL.

3.

THE OWNER/CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY ENGINEERING OR BUILDING INSPECTOR DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.

4.

ALL REMOVABLE PROTECTIVE DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE (5) DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%). SILT AND OTHER DEBRIS SHALL BE REMOVED AFTER EACH RAINFALL.

5.

ALL GRAVEL BAGS SHALL BE BURLAP TYPE WITH 3/4 INCH MINIMUM AGGREGATE.

6.

ADEQUATE EROSION AND SEDIMENT CONTROL AND PERIMETER PROTECTION BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
- SPECIAL NOTES
- PROJECT INFORMATION
- Site Address: _____
- Assessor’s Parcel Number: _____
- Project ID: _____
- Construction Permit No.: _____
- Estimated Construction Start Date _____
- Project Duration _____Months
- Emergency Contact:
- Name: _____
- 24 hour Phone: _____
- Perceived Threat to Storm Water Quality
- ☐ Medium ☐ Low
- If medium box is checked, must attach a site plan sheet showing proposed work area and location of proposed structural BMPs
- For City Use Only
- CITY OF CARLSBAD
STANDARD TIER 1 SWPPP
- Approved By: _____
Date: _____
- Page 1 of ____

		Erosion Control BMPs					Sediment Control BMPs								Tracking Control BMPs			Non-Storm ater Management BMPs					Waste Management and Materials Pollution Control BMPs								
Best Management Practice (BMP) Description →		Geotextiles & Mats	Wood Mulching	Earth Dikes and Drainage Swales	Slope Drains		Silt Fence	Sediment Trap	Check Dam	Fiber Rolls	Gravel Bag Berm	Street Sweeping and Vacuuming	Sandbag Barrier	Storm Drain Inlet Protection		Stabilized Construction Ingress/Egress	Stabilized Construction Roadway		Water Conservation Practices	Paving and Grinding Operations	Potable Water/Irrigation	Vehicle and Equipment Cleaning		Material Delivery and Storage	Material Use	Stockpile Management	Spill Prevention and Control	Solid Waste Management	Hazardous Waste Management	Concrete Waste Management	
CASQA Designation → Construction Activity		EC-7	EC-8	EC-9	EC-11		SE-1	SE-3	SE-4	SE-5	SE-6	SE-7	SE-8	SE-10		TR-1	TR-2		NS-1	NS-3	NS-7	NS-8		WM-1	WM-2	WM-3	WM-4	WM-5	WM-6	WM-8	
	Grading/Soil Disturbance																														
	Trenching/Excavation																														
	Stockpiling																														
	Drilling/Boring																														
	Concrete/Asphalt Sawcutting																														
	Concrete flatwork																														
	Paving																														
	Conduit/Pipe Installation																														
	Stucco/Mortar Work																														
	Waste Disposal																														
	Staging/Lay Down Area																														
	Equipment Maintenance and Fueling																														
	Hazardous Substance Use/Storage																														
	Dewatering																														
	Site Access Across Dirt																														
	Other (list):																														

Instructions: Begin by reviewing the list of construction activities and checking the box to the left of any activity that will occur during the proposed construction. Add any other activity descriptions in the blank activity description boxes provided for that purpose and place a check in the box immediately to the left of the added activity description. For each activity described, pick one or more best management practices (BMPs) from the list located along the top of the form. Then place an X in the box at the place where the activity row intersects with the BMP column. Do this for each activity that was checked off and for each of the selected BMPs selected from the list. For Example – If the project includes site access across dirt, then check the box to the left of “Site Access Across Dirt”. Then review the list for something that applies such as “Stabilized Construcion Ingress/Egress” under Tracking Control. Follow along the “Site Access Across Dirt” row until you get to the “Stabilized Construction Ingress/Egress” column and place an X in the box where the two meet. As another example say the project included a stockpile that you intend to cover with a plastic sheet. Since plastic sheeting is not on the list of BMPs, then write in “Cover with Plastic” in the blank column under the heading Erosion Control BMPs. Then place an X in the box where “Stockpiling” row intersects the new “Cover with Plastic” column.

To learn more about what each BMP description means, you may wish to review the [BMP Reference Handout](#) prepared to assist applicants in the selection of appropriate Best Management Practice measures. The reference also explains the California Stormwater Quality Association (CASQA) designation and how to apply the various selected BMPs to a project.



Scale of map

Legend

Site Map

Features displayed on the map must include:

- An outline of the entire property
- Location and brief description of construction activity areas (e.g. grading, building, trenching, fueling areas, waste container area, wash racks, hazardous material storage areas, etc.)
- Location and flow direction arrows for existing drainage facilities (ditches, channels, inlets, storm drains, etc.)
- Location of existing storm water BMP controls (sediment basins, oil/water separators, sumps, etc.)
- Location of proposed storm water BMP controls with brief description or legend reference

Appendix I

City Standard Storm Water Pollution Prevention Notes

STORM WATER POLLUTION PREVENTION

GENERAL SITE MANAGEMENT REQUIREMENTS

THE FOLLOWING GENERAL SITE MANAGEMENT REQUIREMENTS SHALL BE ADHERED TO THROUGHOUT THE DURATION OF THE CONSTRUCTION WORK (YEAR ROUND):

1. IN CASE EMERGENCY WORK IS REQUIRED, CONTACT _____ FROM _____ AT _____.
2. DEVICES SHOWN ON CITY APPROVED PLANS SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE ENGINEERING INSPECTOR.
3. THE CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY ENGINEER AFTER EACH RUN-OFF PRODUCING RAINFALL.
4. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY ENGINEER DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.
5. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
6. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPE AT THE CONCLUSION OF EACH WORKING DAY.
7. ALL REMOVABLE PROTECTIVE DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE (5) DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%). SILT AND OTHER DEBRIS SHALL BE REMOVED AFTER EACH RAINFALL.
8. ALL GRAVEL BAGS SHALL BE BURLAP TYPE WITH 3/4 INCH MINIMUM AGGREGATE.
9. ALL GRADED AREAS MUST HAVE EROSION CONTROL PROTECTION BEST MANAGEMENT PRACTICE MEASURES PROPERLY INSTALLED.
10. ADEQUATE PERIMETER PROTECTION BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
11. ADEQUATE SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
12. ADEQUATE MEASURES TO CONTROL OFFSITE SEDIMENT TRACKING MUST BE INSTALLED AND MAINTAINED.
13. A MINIMUM OF 125% OF THE MATERIAL NEEDED TO INSTALL STANDBY BEST MANAGEMENT PRACTICE MEASURES TO PROTECT THE EXPOSED AREAS FROM EROSION AND PREVENT SEDIMENT DISCHARGES, MUST BE STORED ONSITE. AREAS ALREADY PROTECTED FROM EROSION USING PHYSICAL STABILIZATION OR ESTABLISHED VEGETATION STABILIZATION MEASURES ARE NOT CONSIDERED TO BE "EXPOSED" FOR PURPOSES OF THIS REQUIREMENT.

14. THE OWNER/DEVELOPER/CONTRACTOR MUST HAVE AN APPROVED "WEATHER TRIGGERED" ACTION PLAN AND BE ABLE TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MEASURES TO COMPLETELY PROTECT THE EXPOSED PORTIONS OF THE SITE WITHIN 48 HOURS OF A PREDICTED STORM EVENT (A PREDICTED STORM EVENT IS DEFINED AS A FORECASTED, 40% CHANCE OF RAIN BY THE NATIONAL WEATHER SERVICE). ON REQUEST, THE OWNER/CONTRACTOR MUST PROVIDE PROOF OF THIS CAPABILITY THAT IS ACCEPTABLE TO THE CITY.
15. DEPLOYMENT OF PHYSICAL OR VEGETATION EROSION CONTROL MEASURES MUST COMMENCE AS SOON AS SLOPES ARE COMPLETED. THE OWNER/CONTRACTOR MAY NOT CONTINUE TO RELY ON THE ABILITY TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MATERIALS TO PREVENT EROSION OF SLOPES THAT HAVE BEEN COMPLETED.
16. UNLESS OTHERWISE SPECIFIED ON THE GRADING PLANS OR THE CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN DOCUMENTS, THE AREA THAT CAN BE CLEARED, GRADED, AND LEFT EXPOSED AT ONE TIME IS LIMITED TO THE AMOUNT OF ACREAGE THAT THE CONTRACTOR CAN ADEQUATELY PROTECT PRIOR TO A PREDICTED RAINSTORM. IT MAY BE NECESSARY TO DEPLOY EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES IN AREAS THAT ARE NOT COMPLETED AND ARE NOT ACTIVELY BEING WORKED BEFORE ADDITIONAL GRADING IS ALLOWED TO PROCEED, AT THE DISCRETION OF THE PUBLIC WORKS INSPECTOR.

RAINY SEASON SITE MANAGEMENT REQUIREMENTS (OCTOBER 1 – APRIL 30)

THE FOLLOWING RAINY SEASON SITE MANAGEMENT REQUIREMENTS SHALL BE ADHERED TO THROUGHOUT THE RAINY SEASON DEFINED AS BEGINNING ON OCTOBER 1 OF ANY YEAR AND EXTENDING THROUGH APRIL 30TH OF THE FOLLOWING YEAR:

1. EROSION CONTROL, PERIMETER PROTECTION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE UPGRADED IF NECESSARY TO PROVIDE SUFFICIENT PROTECTION FOR STORMS LIKELY TO OCCUR DURING THE RAINY SEASON.
2. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS EMINENT.
3. ADEQUATE PHYSICAL OR VEGETATION EROSION CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND ESTABLISHED FOR ALL COMPLETED SLOPES PRIOR TO THE START OF THE RAINY SEASON. THESE BEST MANAGEMENT PRACTICE MEASURES MUST BE MAINTAINED THROUGHOUT THE RAINY SEASON. IF A SELECTED BEST MANAGEMENT PRACTICE MEASURE FAILS, IT MUST BE REPAIRED AND IMPROVED, OR REPLACED WITH AN ACCEPTABLE ALTERNATE AS SOON AS IT IS SAFE TO DO SO. THE FAILURE OF A BEST MANAGEMENT PRACTICE MEASURE INDICATES IT WAS NOT ADEQUATE FOR THE CIRCUMSTANCES IN WHICH IT WAS USED. REPAIRS OR REPLACEMENTS MUST THEREFORE PUT A MORE ROBUST BEST MANAGEMENT PRACTICE MEASURE IN PLACE.

4. ALL VEGETATION EROSION CONTROL MUST BE ESTABLISHED PRIOR TO THE RAINY SEASON TO BE CONSIDERED AS A BEST MANAGEMENT PRACTICE MEASURE.
5. THE AMOUNT OF EXPOSED SOIL ALLOWED AT ONE TIME SHALL NOT EXCEED THAT WHICH CAN BE ADEQUATELY PROTECTED BY DEPLOYING STANDBY EROSION CONTROL AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES PRIOR TO A PREDICTED RAINSTORM.
6. A DISTURBED AREA THAT IS NOT COMPLETED BUT THAT IS NOT BEING ACTIVELY GRADED MUST BE FULLY PROTECTED FROM EROSION IF LEFT FOR 10 OR MORE DAYS. THE ABILITY TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MEASURE MATERIALS IS NOT SUFFICIENT FOR THESE AREAS. BEST MANAGEMENT PRACTICE MEASURES MUST ACTUALLY BE DEPLOYED.

EROSION CONTROL HYDROSEEDING, PLANTING AND IRRIGATION

1. ALL PERMANENT AND TEMPORARY EROSION CONTROL PLANTING AND IRRIGATION SHALL BE INSTALLED AND MAINTAINED AS REQUIRED IN SECTION 212 OF THE STANDARD SPECIFICATIONS AND THE FOLLOWING:
 - A HYDROSEEDING SHALL BE APPLIED TO:
 - 1 ALL SLOPES THAT ARE GRADED 6:1 (HORIZONTAL TO VERTICAL) OR STEEPER WHEN THEY ARE:
 - a. THREE FEET OR MORE IN HEIGHT AND ADJACENT TO A PUBLIC WALL OR STREET.
 - b. ALL SLOPES 4 FEET OR MORE IN HEIGHT.
 - 2 AREAS GRADED FLATTER THAN 6:1 WHEN ANY OF THE FOLLOWING CONDITIONS EXIST:
 - a. NOT SCHEDULED FOR IMPROVEMENTS (CONSTRUCTION OR GENERAL LANDSCAPING) WITHIN 60 DAYS OF ROUGH GRADING.
 - b. IDENTIFIED BY THE PARKS AND RECREATION DIRECTOR AS HIGHLY VISIBLE TO THE PUBLIC.
 - c. HAVE ANY SPECIAL CONDITION IDENTIFIED BY THE CITY ENGINEER THAT WARRANTS IMMEDIATE TREATMENT.
 - B HYDROSEEDING AREAS SHALL BE IRRIGATED IN ACCORDANCE WITH THE FOLLOWING CRITERIA:
 - 1 ALL SLOPES THAT ARE GRADED 6:1 OR STEEPER AND THAT ARE:
 - a. THREE TO EIGHT FEET IN HEIGHT SHALL BE IRRIGATED BY HAND WATERING FROM QUICK COUPLERS/HOSE BIBS OR A CONVENTIONAL SYSTEM OF LOW PRECIPITATION SPRINKLER HEADS PROVIDING 100% COVERAGE.
 - b. GREATER THAN 8 FEET IN HEIGHT SHALL BE WATERED BY A CONVENTIONAL SYSTEM OF LOW PRECIPITATION SPRINKLER HEADS PROVIDING 100% COVERAGE.
 - 2 AREAS SLOPED LESS THAN 6:1 SHALL BE IRRIGATED AS APPROVED BY THE CITY ENGINEER, PRIOR TO HYDROSEEDING. THE DEVELOPER SHALL SUBMIT A PROPOSED SCHEME TO PROVIDE IRRIGATION TO THE CITY ENGINEER. THE PROPOSAL SHALL BE SPECIFIC REGARDING THE NUMBERS, TYPES, AND COSTS OF THE ELEMENTS OF THE PROPOSED SYSTEM.
 - 3 IRRIGATION SHALL MAINTAIN THE MOISTURE LEVEL OF THE SOIL AT THE OPTIMUM LEVEL FOR THE GROWTH OF THE HYDROSEEDING GROWTH.

C HYDROSEEDING MIX SHALL CONSIST OF ALL OF THE FOLLOWING:

- 1 SEED MIX SHALL CONSIST OF NO LESS THAN:
 - a. 20 lbs. PER ACRE OF ROSE CLOVER
 - b. 20 lbs. PER ACRE OF ZORRO FESCUE
 - c. 3 lbs. PER ACRE OF E SCHOOL CIA CALIFORNICA
 - d. 4 lbs. PER ACRE OF ACHILLEA MILLEFOLIA
 - e. 3 lbs. PER ACRE OF ALYSSUM (CARPET OF SNOW)
 - f. 1/2 lb. PER ACRE OF DIMORPHOLECA
 - g. ITEMS c,d,e, AND f OF THIS SUBSECTION MAY BE OMITTED ON LOCATIONS WHERE THE AREA BEING HYDROSEEDING IS NOT VISIBLE FROM EITHER A PUBLIC STREET OR RESIDENTIAL STRUCTURES.
 - h. ITEM a OF THIS SUBSECTION MUST BE INOCULATED WITH A NITROGEN FIXING BACTERIA AND APPLIED DRY EITHER BY DRILLING OR BROADCASTING BEFORE HYDROSEEDING.
 - i. ALL SEED MATERIALS SHALL BE TRANSPORTED TO THE JOBSITE IN UNOPENED CONTAINERS WITH THE CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE CERTIFICATION TAG ATTACHED TO, OR PRINTED ON SAID CONTAINERS.
 - j. NON-PHYTO-TOXIC WETTING AGENTS MAY BE ADDED TO THE HYDROSEED SLURRY AT THE DISCRETION OF THE CONTRACTOR.
- 2 TYPE 1 MULCH APPLIED AT THE RATE OF NO LESS THAN 2000 lbs PER ACRE. TYPE 6 MULCH (STRAW) MAY BE SUBSTITUTED, ALL OR PART, FOR HYDRAULICALLY APPLIED FIBER MATERIAL. WHEN STRAW IS USED, IT MUST BE ANCHORED TO THE SLOPE BY MECHANICALLY PUNCHING NO LESS THAN 50% OF THE STRAW INTO THE SOIL.
- 3 FERTILIZER CONSISTING OF AMMONIUM PHOSPHATE SULFATE, 16-20-0, WITH 15% SULPHUR APPLIED AT THE RATE OF 500 lbs. PER ACRE.

D AREAS TO BE HYDROSEEDING SHALL BE PREPARED PRIOR TO HYDROSEEDING BY:

- 1 ROUGHENING THE SURFACE TO BE PLANTED BY ANY OR A COMBINATION OF:
 - a. TRACK WALKING SLOPES STEEPER THAN 6:1
 - b. HARROWING AREAS 6:1 OR FLATTER THAT ARE SUFFICIENTLY FRIABLE.
 - c. RIPPING AREAS THAT WILL NOT BREAK UP USING ITEMS a OR b ABOVE.
- 2 CONDITIONING THE SOILS SO THAT IT IS SUITABLE FOR PLANTING BY:
 - a. ADJUSTING THE SURFACE SOIL MOISTURE TO PROVIDE A DAMP BUT NOT SATURATED SEED BED.
 - b. THE ADDITION OF SOIL AMENDMENTS, PH ADJUSTMENT, LEACHING COVERING SALINE SOILS TO PROVIDED VIABLE CONDITIONS FOR GROWTH.

E HYDROSEEDING AREAS SHALL BE MAINTAINED TO PROVIDE A VIGOROUS GROWTH UNTIL THE PROJECT IS PERMANENTLY LANDSCAPED OR, FOR AREAS WHERE HYDROSEEDING IS THE PERMANENT LANDSCAPING, UNTIL THE PROJECT IS COMPLETED AND ALL BONDS RELEASED.

2. ALL SLOPES SHALL HAVE IRRIGATION INSTALLED AND BE STABILIZED, PLANTED AND/OR HYDROSEEDDED WITHIN TEN (10) DAYS OF THE TIME WHEN EACH SLOPE IS BROUGHT TO GRADE AS SHOWN ON THE APPROVED GRADING PLANS.
3. SHOULD GERMINATION OF HYDROSEEDDED SLOPES FAIL TO PROVIDE EFFICIENT COVERAGE OF GRADED SLOPES (90% COVERAGE) PRIOR TO OCTOBER 1, THE SLOPES SHALL BE STABILIZED BY AN APPROPRIATE EROSION CONTROL MATTING MATERIAL APPROVED BY THE PUBLIC WORKS INSPECTOR.
4. LANDSCAPING SHALL BE ACCOMPLISHED ON ALL SLOPES AND PADS AS REQUIRED BY THE CITY OF CARLSBAD LANDSCAPE MANUAL, THE LANDSCAPING PLANS FOR THIS PROJECT, DRAWING NO. _____, AND/OR AS DIRECTED BY THE CITY ENGINEER OR PLANNING DIRECTOR.
5. THE OWNER/APPLICANT SHALL ENSURE THAT ALL CONTRACTORS SHALL COORDINATE THE WORK OF THIS CONSTRUCTION SWPPP WITH THAT SHOWN ON ANY GRADING PLANS, LANDSCAPE AND IRRIGATION PLANS AND IMPROVEMENT PLANS AS REQUIRED FOR THIS PROJECT WORK.

Appendix J

Excerpts from EPA Guidelines for Selecting Construction BMPs

Chapter 4: SWPPP Development—Selecting Erosion and Sediment Control BMPs

► This chapter presents a brief discussion of erosion and sediment control principles and a discussion of some commonly used BMPs.

This document is not intended as an engineering or design manual on BMPs. The engineer or other qualified person that develops the details of your sediment and erosion control plan should be using the appropriate state or local specifications. The descriptions below provide a kind of checklist of the things to look for and some helpful installation and maintenance hints.

Erosion and sediment controls are the structural and non-structural practices used during the construction process to keep sediment in place (erosion control) and to capture any sediment that is moved by stormwater before it leaves the site (sediment control). Erosion controls—keeping soil where it is—are the heart of any effective SWPPP. Your SWPPP should rely on erosion controls as the primary means of preventing stormwater pollution. Sediment controls provide a necessary second line of defense to properly designed and installed erosion controls.

The suite of BMPs that you include in your SWPPP should reflect the specific conditions at the site. The information that you collected in the previous steps should help you select the appropriate BMPs for your site. An effective SWPPP includes a combination or suite of BMPs that are designed to work together.

Ten Keys to Effective Erosion and Sediment Control (ESC)

The ultimate goal of any SWPPP is to protect rivers, lakes, wetlands, and coastal waters that could be affected by your construction project. The following principles and tips should help you build an effective SWPPP. **Keep in mind that there are many BMP options available to you. We have selected a few common BMPs to help illustrate the principles discussed in this chapter.**

Erosion Control (keeping the dirt in place) and Minimizing the Impact of Construction

1. Minimize disturbed area and protect natural features and soil
2. Phase construction activity
3. Control stormwater flowing onto and through the project
4. Stabilize soils promptly
5. Protect slopes

Sediment Controls (the second line of defense)

6. Protect storm drain inlets
7. Establish perimeter controls
8. Retain sediment on-site and control dewatering practices
9. Establish stabilized construction exits
10. Inspect and maintain controls

Take a Closer Look...

BMPs in Combination

BMPs work much better when they are used in combination. For instance, a silt fence should not be used alone to address a bare slope. An erosion control BMP should be used to stabilize the slope, and the silt fence should serve as the backup BMP.

What does this mean to me?

Wherever possible, rely on erosion controls to keep sediment in place. Back up those erosion controls with sediment controls to ensure that sediment doesn't leave your site. Continually evaluate your BMPs. Are they performing well? Could the addition of a supplemental BMP improve performance? Should you replace a BMP with another one that might work better? Using BMPs in series also gives you some protection in case one BMP should fail.

Erosion Control and Minimizing the Impact of Construction

ESC Principle 1: Minimize disturbed area and protect natural features and soil. As you put together your SWPPP, carefully consider the natural features of the site that you assessed in Chapter 3. By carefully delineating and controlling the area that will be disturbed by grading or construction activities, you can greatly reduce the potential for soil erosion and stormwater pollution problems. Limit disturbed areas to only those necessary for the construction of your project. Natural vegetation is your best and cheapest erosion control BMP.



Figure 7. Protect vegetated buffers by using silt fence or other sediment controls.

Protecting and preserving topsoil is also a good BMP. Removing topsoil exposes underlying layers that are often more prone to erosion and have less infiltration capacity. Keeping topsoil in place preserves the natural structure of the soils and aids the infiltration of stormwater.

ESC Principle 2: Phase construction activity. Another technique for minimizing the duration of exposed soil is phasing. By scheduling or sequencing your construction work and concentrating it in certain areas, you can minimize the amount of soil that is exposed to the elements at any given time. Limiting the area of disturbance to places where construction activities are underway and stabilizing them as quickly as possible can be one of your most effective BMPs.

ESC Principle 3: Control stormwater flowing onto and through your project. Plan for any potential stormwater flows coming onto the project area from upstream locations, and divert (and slow) flows to prevent erosion. Likewise, the volume and velocity of on-site stormwater runoff should be controlled to minimize soil erosion.

Example BMP: Diversion Ditches or Berms

Description: Diversion ditches or berms direct runoff away from unprotected slopes and may also direct sediment-laden runoff to a sediment-trapping structure. A diversion ditch can be located at the upslope side of a construction site to prevent surface runoff from entering the disturbed area. Ditches or berms on slopes need to be designed for erosive velocities. Also, ensure that the diverted water is released through a stable outlet and does not cause downslope or downstream erosion or flooding.

Installation Tips:

- Divert run-on and runoff away from disturbed areas
- Ensure that the diversion is protected from erosion, using vegetation, geotextiles, or other appropriate BMPs
- Divert sediment-laden water to a sediment-trapping structure
- Use practices that encourage infiltration of stormwater runoff wherever possible

Maintenance:

- Inspect diversions and berms, including any outlets, regularly and after each rainfall
- Remove any accumulated sediment

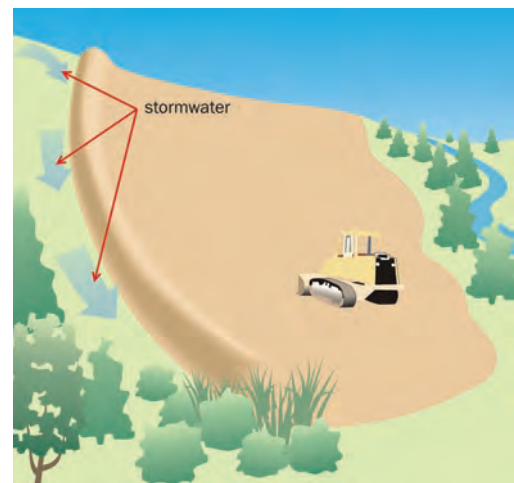


Figure 8. Illustration of a construction berm to divert stormwater away from the disturbed construction area.

ESC Principle 4: Stabilize soils promptly.

Where construction activities have temporarily or permanently ceased, you should stabilize exposed soils to minimize erosion. You should have stabilization measures in place after grading activities have ceased (many permits require stabilization within a specified time frame). You can provide either temporary or permanent cover to protect exposed soils. Temporary measures are necessary when an area of a site is disturbed but where activities in that area are not completed or until permanent BMPs are established. Topsoil stockpiles should also be protected to minimize any erosion from these areas. Temporary-cover BMPs include temporary seeding, mulches, matrices, blankets and mats, and the use of soil binders (there may be additional state and local requirements for the use of chemical-based soil binders). Permanent-cover BMPs include permanent seeding and planting, sodding, channel stabilization, and vegetative buffer strips. Silt fence and other sediment control measures are not stabilization measures.

SWPPP Tip!

Final Stabilization

Once construction activity in an area is completed and the area is stabilized (typically by achieving 70 percent permanent vegetative cover), you can mark this area on your SWPPP and discontinue inspections in that area. By bringing areas of your site to final stabilization, you can reduce your workload associated with maintaining and inspecting BMPs. For more information on final stabilization, see Chapter 9.

Example BMP: Temporary Seeding

Description: Temporarily seeding an area to establish vegetative cover is one of the most effective, and least expensive, methods of reducing erosion. This approach, as a single BMP, might not be appropriate on steep slopes, when vegetation cannot be established quickly enough to control erosion during a storm event, or when additional activities might occur soon in the area.

Installation Tips:

- Seed and mulch area (the mulch provides temporary erosion protection by protecting the soil surface, moderating temperature, and retaining moisture while seeds germinate and grow)

- Water regularly, if needed, to ensure quick growth
- Maintain backup BMPs, such as silt fence or settling ponds

SWPPP Tip!

Wind Control BMPs

In areas where dust control is an issue, your SWPPP should include BMPs for wind-erosion control. These consist of mulching, wet suppression (watering), and other practices.

ESC Principle 5: Protect slopes. Protect all slopes with appropriate erosion control controls. Steeper slopes, slopes with highly erodible soils, or long slopes require a more complex combination of controls. Erosion control blankets, bonded fiber matrices, or turf reinforcement mats are very effective options. Silt fence or fiber rolls may also be used to help control erosion on moderate slopes and should be installed on level contours spaced at 10- to 20-foot intervals. You can also use diversion channels and berms to keep stormwater off slopes.

Example BMP: Rolled erosion control products

Description: Erosion control products include mats, geotextiles, and erosion control blankets and products that provide temporary stabilization and help to establish vegetation on disturbed soils. Such products help control erosion and help establish vegetation and are often used on slopes, channels, or stream banks.

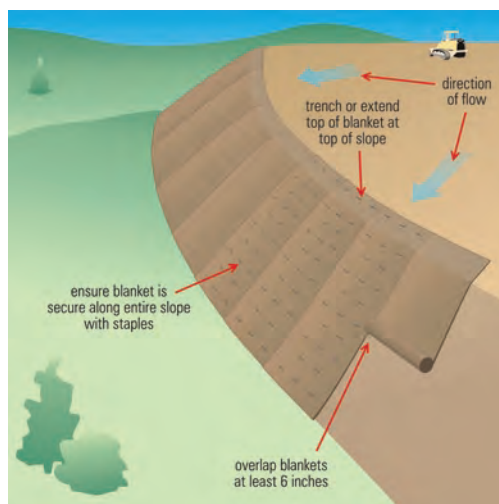


Figure 9. Illustration of erosion control blankets installed on slope.

Installation Tips:

- Use rolled erosion-control products on slopes steeper than 3 to 1 (horizontal to vertical) and in swales or long channels

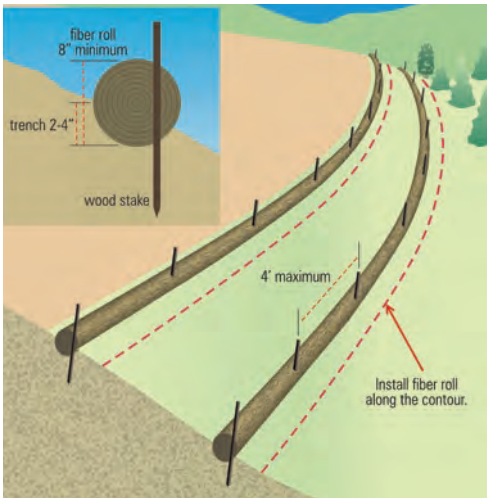


Figure 10. Illustration of a fiber roll installation along a slope.

- Trench the top of the blanket into the ground to prevent runoff from flowing under the blanket
- Overlap the lower end of the top mat over the top of the downslope mat to ensure that runoff stays on top of the blankets and mats
- Staple blankets and mats according to specifications

Maintenance:

- Periodically inspect for signs of erosion or failure
- Repair the blanket or mat if necessary
- Continue inspections until vegetation is established at the level required to qualify as final *stabilization*

ESC Principle 6: Protect storm drain

inlets. Protect all inlets that could receive stormwater from the project until final stabilization of the site has been achieved. Install inlet protection before soil-disturbing activities begin. Maintenance throughout the construction process is important. Upon completion of the project, storm drain inlet protection is one of the temporary BMPs that should be removed. Storm drain inlet protection should be used not only for storm drains within the active construction project, but also for storm drains outside the project area that might receive stormwater discharges from the project. If there are storm drains on private property that could receive stormwater runoff from your project, coordinate with the owners of that property to ensure proper inlet protection.

Example BMP: Storm Drain Inlet Protection

Description: Storm drain inlet protection prevents sediment from entering a storm drain by surrounding or covering the inlet with a filtering material. Several types of filters are commonly used for inlet protection: silt fence, rock-filled bags, or block and gravel. The type of filter used depends on the inlet type (for example, curb inlet, drop inlet), slope, and volume of flow. Many different commercial inlet filters are also available. Some commercial inlet filters are placed in front of or on top of an inlet, while others are placed inside the inlet under the grate.

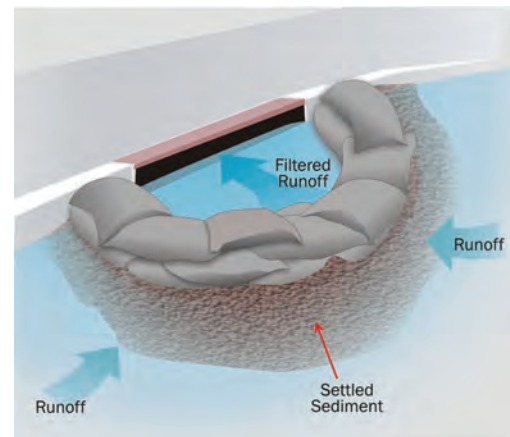


Figure 11. Illustration of a storm drain inlet with rock-filled bags filtering stormwater.

Installation Tips:

- Install inlet protection as soon as storm drain inlets are installed and before land-disturbance activities begin in areas with existing storm drain systems
- Protect all inlets that could receive stormwater from your construction project
- Use in conjunction with other erosion prevention and sediment control BMPs—remember, inlet protection is a secondary BMP!
- Design your inlet protection to handle the volume of water from the area being drained. Ensure that the design is sized appropriately.

Maintenance:

- Inspect inlets frequently and after each rainfall

- Remove accumulated sediment from around the device and check and remove any sediment that might have entered the inlet
- Replace or repair the inlet protection if it becomes damaged
- Sweep streets, sidewalks, and other paved areas regularly

SWPPP Tip!

Storm drain inlet protection should never be used as a primary BMP! Use erosion control techniques such as hydromulching or erosion-control blankets to prevent erosion. Use inlet protection and other sediment control BMPs as a *backup* or last line of defense.

ESC Principle 7: Establish perimeter controls.

Maintain natural areas and supplement them with silt fence and fiber rolls around the perimeter of your site to help prevent soil erosion and stop sediment from leaving the site. Install controls on the downslope perimeter of your project (it is often unnecessary to surround the entire site with silt fence). Sediment barriers can be used to protect stream buffers, riparian

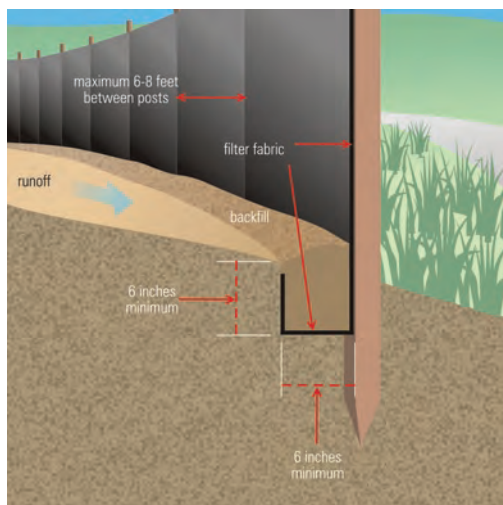


Figure 12. Illustration of proper techniques to use in installing silt fence.

areas, wetlands, or other waterways. They are effective only in small areas and should not be used in areas of concentrated flow.

Example BMP: Silt Fence and Fiber Rolls

Description: A silt fence is a temporary sediment barrier consisting of a geotextile attached to supporting posts and trenched into the ground. Silt fencing is intended to retain sediment that has been dislodged by stormwater. It is designed only for runoff from small areas and is not intended to handle flows from large slopes or in areas of concentrated flow. Fiber rolls serve the same purpose and consist of an open mesh tubular sleeve filled with a fibrous material which traps sediment. Fiber rolls are generally staked to the ground.

Installation Tips:

DO:

- Use silt fence or fiber rolls as perimeter controls, particularly at the lower or down slope edge of a disturbed area
- Leave space for maintenance between toe of slope and silt fence or roll
- Trench in the silt fence on the uphill side (6 inches deep by 6 inches wide)
- Install stakes on the downhill side of the fence or roll
- Curve the end of the silt fence or fiber roll up-gradient to help it contain runoff

DON'T:

- Install a silt fence or fiber rolls in ditches, channels, or areas of concentrated flow
- Install it running up and down a slope or hill
- Use silt fencing or fiber rolls alone in areas that drain more than a quarter-acre per 100 feet of fence

Maintenance:

- Remove sediment when it reaches one-third of the height of the fence or one-half the height of the fiber roll
- Replace the silt fence or roll where it is worn, torn, or otherwise damaged
- Retrench or replace any silt fence or roll that is not properly anchored to the ground

ESC Principle 8: Retain sediment on-site and control dewatering practices. Sediment barriers described in ESC Principle 7 can trap sediment from small areas, but when sediment retention from a larger area is required, consider using a temporary sediment trap or sediment basin. These practices detain sediment-laden runoff for a period of time, allowing sediment to settle before the runoff is discharged. Proper design and maintenance are essential to ensure that these practices are effective.

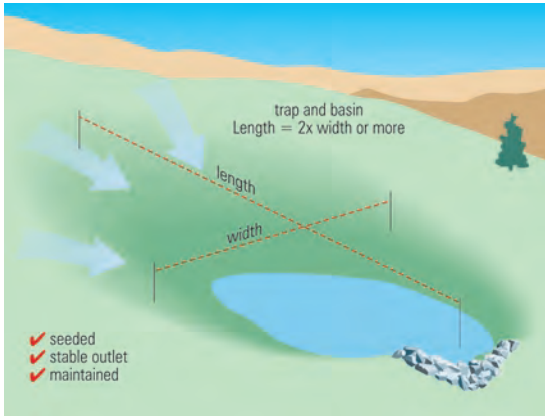


Figure 13. Illustration of a sediment basin.

You should use a sediment basin for common drainage locations that serve an area with 10 or more acres disturbed at any one time. The basin should be designed to provide storage for

the volume of runoff from the drainage area for at least a 2-year, 24-hour storm (or 3,600 cubic feet of storage per acre drained, which is enough to contain 1 inch of runoff, if the 2-year, 24-hour calculation has not been performed). Check your permit for exact basin sizing requirements. Sediment basins should be located at low-lying areas of the site and on the down-gradient side of bare soil areas where flows converge. Do not put sediment traps or basins in or immediately adjacent to flowing streams or other waterways.

Where a large sediment basin is not practical, use smaller sediment basins or sediment traps (or both) where feasible. At a minimum, use silt fences, vegetative buffer strips, or equivalent sediment controls for all down-gradient boundaries (and for those side-slope boundaries deemed appropriate for individual site conditions).

Dewatering practices are used to remove ground water or accumulated rain water from excavated areas. Pump muddy water from these areas to a temporary or permanent sedimentation basin or to an area completely enclosed by silt fence in a flat vegetated area where discharges can infiltrate into the ground.

Never discharge muddy water into storm drains, streams, lakes, or wetlands unless the sediment has been removed before discharge.

Keep in mind that some states and local jurisdictions require a separate permit for dewatering activities at a site.

ESC Principle 9: Establish stabilized construction exits. Vehicles entering and leaving the site have the potential to track significant amounts of sediment onto streets. Identify and clearly mark one or two locations where vehicles will enter and exit the site and focus stabilizing measures at those locations. Construction entrances are commonly made from large crushed rock. They can be further stabilized using stone pads or concrete. Also, steel wash racks and a hose-down system will remove even more mud and debris from vehicle tires. Divert runoff from wash areas to a sediment trap or basin. No system is perfect, so sweeping the street regularly completes this BMP.

Example BMP: Stabilized Construction Exit

Description: A rock construction exit can reduce the amount of mud transported onto paved roads by vehicles. The construction exit does this by removing mud from vehicle tires before the vehicle enters a public road.

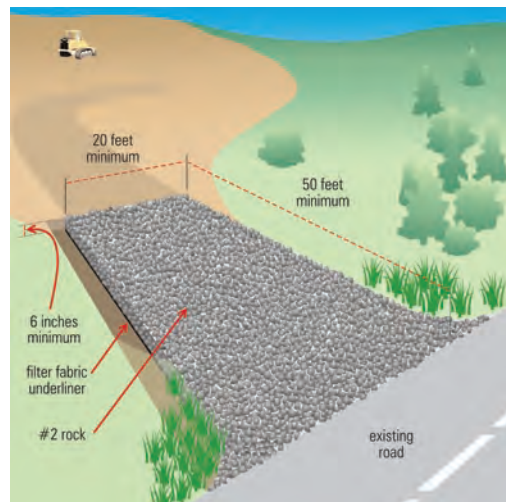


Figure 14. Illustration of a stabilized construction exit.

You might also want to install a wheel wash when mud is especially difficult to remove or space doesn't allow sufficient tire revolutions (four or five are needed) before exiting the site. Direct wash water to a suitable settling area—do not discharge wash water to a stream or storm drain!

Installation tips:

- Ensure that the exit is at least 50 feet long (generally, the length of two dump trucks) and graded so runoff does not enter the adjacent street
- Place a geotextile fabric under a layer of aggregate at least 6–12 inches thick. The stones or aggregate should be 3–6 inches in diameter
- Train employees and subcontractors to use the designated construction exits. Empower your employees to provide directions to subcontractors and others that are not on the site every day

Maintenance:

- Replenish or replace aggregate if it becomes clogged with sediment
- Sweep the street regularly

ESC Principle 10: Inspect and maintain controls.

Inspection and maintenance is just as important as proper planning, design, and installation of controls. Without adequate maintenance, erosion and sediment controls will quickly fail, sometimes after just one rainfall, and cause significant water quality problems and potential violations of the NPDES construction general permit. Your permit likely requires you to maintain your BMPs at all times. To do this effectively, you should establish an inspection and maintenance approach or strategy that includes both regular and spot inspections. Inspecting both prior to predicted storm events and after will help ensure that controls are working effectively. Perform maintenance or corrective action as soon as problems are noted. **Inspection and maintenance of BMPs are addressed in more detail in Chapter 6.**

Other Sediment and Erosion Control Techniques

As mentioned at the beginning of this chapter, there are many other erosion and sediment control techniques that can be used effectively. The BMPs highlighted in this chapter are among those more commonly used and highlight many general erosion and sediment control principles for which other BMPs may be used effectively. Check to see if your state or local government has developed a BMP design manual for detailed information on any BMP you are considering. Appendix D lists several good BMP design manuals. You can also find out more about various BMPs by visiting EPA's Menu of BMPs at www.epa.gov/npdes/menuofbmps

The following BMPs are also commonly used at construction sites.

Erosion control measures:

- Surface roughening, trackwalking, scarifying, sheepsfoot rolling, imprinting
- Soil bioengineering techniques (e.g., live staking, fascines, brush wattles)
- Composting
- Sodding

Sediment control and runoff management measures:

- Gravel bag barrier
- Compost berm
- Rock or brush filters
- Baffles or skimmers in sediment basins to increase effectiveness
- Lowering soil levels near streets and sidewalks to prevent runoff
- Level spreaders
- Energy dissipaters
- Check dams

Chapter 5: SWPPP Development—Selecting Good Housekeeping BMPs

Six Key Pollution Prevention Principles for Good Housekeeping

Construction projects generate large amounts of building-related waste, which can end up polluting stormwater runoff if not properly managed. The suite of BMPs that are described in your SWPPP must include pollution prevention (P2) or good housekeeping practices that are designed to prevent contamination of stormwater from a wide range of materials and wastes at your site. The six principles described below are designed to help you identify the pollution prevention practices that should be described in your SWPPP and implemented at your site.

1. Provide for waste management
2. Establish proper building material staging areas
3. Designate paint and concrete washout areas
4. Establish proper equipment/vehicle fueling and maintenance practices
5. Control equipment/vehicle washing and allowable non-stormwater discharges
6. Develop a spill prevention and response plan

P2 Principle 1: Provide for waste management. Design proper management procedures and practices to prevent or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at your site. Practices such as trash disposal, recycling, proper material handling, and cleanup measures can reduce the potential for stormwater runoff to pick up construction site wastes and discharge them to surface waters.



Figure 15. Illustration showing construction materials with secondary containment and overhead cover to prevent stormwater contamination.

Provide convenient, well-maintained, and properly located toilet facilities. Provide for regular inspections, service, and disposal. Locate toilet facilities away from storm drain inlets and waterways to prevent accidental spills and contamination of stormwater. Treat or dispose of sanitary and septic waste in accordance with state or local regulations.

Proper material use, storage, waste disposal, and training of employees and subcontractors can prevent or reduce the discharge of hazardous and toxic wastes to stormwater. Implement a comprehensive set of waste-management practices for hazardous or toxic materials, such as paints, solvents, petroleum products, pesticides, wood preservatives, acids, roofing tar, and other materials. Practices should include storage, handling, inventory, and cleanup procedures, in case of spills (see the following P2 principles).

► This chapter presents a brief discussion of good housekeeping principles to consider to ensure your construction site does not contaminate stormwater runoff.

As noted in Chapter 3, sediment is the principal pollutant of concern in stormwater discharges from construction sites. But, EPA's CGP and many state construction general permits require that the SWPPP describe good housekeeping measures for other pollutants that might be found on construction sites. This chapter discusses these measures.

Waste Management Checklist

Solid or Construction Waste

- ✓ Designate trash and bulk waste-collection areas on-site
- ✓ Recycle materials whenever possible (e.g., paper, wood, concrete, oil)
- ✓ Segregate and provide proper disposal options for hazardous material wastes
- ✓ Clean up litter and debris from the construction site daily
- ✓ Locate waste-collection areas away from streets, gutters, watercourses, and storm drains. Waste-collection areas (dumpsters, and such) are often best located near construction site entrances to minimize traffic on disturbed soils. Consider secondary containment around waste collection areas to further minimize the likelihood of contaminated discharges.

Sanitary and Septic Waste

- ✓ Provide restroom facilities on-site
- ✓ Maintain clean restroom facilities and empty porta-johns regularly
- ✓ Provide secondary containment pans under porta-johns, where possible
- ✓ Provide tie-downs or stake downs for porta-johns in areas of high winds
- ✓ Educate employees, subcontractors, and suppliers on locations of facilities
- ✓ Do not discharge or bury wastewater at the construction site
- ✓ Inspect facilities for leaks, repair or replace immediately

Hazardous Materials and Wastes

- ✓ Develop and implement employee and subcontractor education, as needed, on hazardous and toxic waste handling, storage, disposal, and cleanup
- ✓ Designate hazardous waste-collection areas on-site
- ✓ Place all hazardous and toxic material wastes in secondary containment
- ✓ Hazardous waste containers should be inspected to ensure that all containers are labeled properly and that no leaks are present

P2 Principle 2: Establish proper building material handling and staging areas.

Your SWPPP should include comprehensive handling and management procedures for building materials, especially those that are hazardous or toxic. Paints, solvents, pesticides, fuels and oils, other hazardous materials or any building materials that have the potential to contaminate stormwater should be stored indoors or under cover whenever possible or in areas with secondary containment. Secondary containment prevents a spill from spreading across the site and include dikes, berms, curbing, or other containment methods. Secondary containment techniques should also ensure the protection of ground water. Designate staging areas for activities such as fueling vehicles, mixing paints, plaster, mortar, and so on. Designated staging areas will help you to monitor the use of materials and to clean up any spills. Training employees and subcontractors is essential to the success of this pollution prevention principle.

SWPPP Tip!

Material Staging Area Measures

Your SWPPP should include procedures for storing materials that can contribute pollutants to stormwater. Consider the following:

- Train employees and subcontractors in proper handling and storage practices
- Designate site areas for storage. Provide storage in accordance with secondary containment regulations and provide cover for hazardous materials when necessary. Ensure that storage containers are regularly inspected for leaks, corrosion, support or foundation failure, or any other signs of deterioration and tested for soundness
- Reuse and recycle construction materials when possible

P2 Principle 3: Designate washout areas.

Concrete contractors should be encouraged, where possible, to use the washout facilities at their own plants or dispatch facilities. If it is necessary to provide for concrete washout areas on-site, designate specific washout areas and design facilities to handle anticipated washout water. Washout areas should also be provided for paint and stucco operations. Because washout areas can be a source of pollutants from leaks or spills,

EPA recommends that you locate them at least 50 yards away from storm drains and watercourses whenever possible.

Several companies rent or sell prefabricated washout containers, and some provide disposal of waste solids and liquids along with the containers. These prefabricated containers are sturdy and provide a more reliable option for preventing leaks and spills of wash water than self-constructed washouts. Alternatively, you can construct your own washout area, either by digging a pit and lining it with 10 mil plastic sheeting or creating an aboveground structure from straw bales or sandbags with a plastic liner. If you create your own structure, you should inspect it daily for leaks or tears in the plastic because these structures are prone to failure.

Regular inspection and maintenance are important for the success of this BMP. Both self-constructed and prefabricated washout containers can fill up quickly when concrete, paint, and stucco work are occurring on large portions of the site. You should also inspect for evidence that contractors are using the washout areas and not dumping materials onto the ground or into drainage facilities. If the washout areas are not being used regularly, consider posting additional signage, relocating the facilities to more convenient locations, or providing training to workers and contractors.

SWPPP Tip!

Washout Area Measures

When concrete, paint, or stucco is part of the construction process, consider these practices which will help prevent contamination of stormwater. Include the locations of these areas and your maintenance and inspection procedures in your SWPPP.

- Do not washout concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams
- Establish washout areas and advertise their locations with signs
- Provide adequate containment for the amount of wash water that will be used
- Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed
- Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground. It should not be discharged to a sanitary sewer system without first receiving written permission from the system operator

P2 Principle 4: Establish proper equipment/vehicle fueling and maintenance practices.

Performing equipment/vehicle fueling and maintenance at an off-site facility is preferred over performing these activities on the site, particularly for road vehicles (e.g., trucks, vans). For grading and excavating equipment, this is usually not possible or desirable. Create an on-site fueling and maintenance area that is clean and dry. The on-site fueling area should have a spill kit, and staff should know how to use it. If possible, conduct vehicle fueling and maintenance activities in a covered area; outdoor vehicle fueling and maintenance is a potentially significant source of stormwater pollution. Significant maintenance on vehicles and equipment should be conducted off-site.

SWPPP Tip!

Equipment/Vehicle Fueling and Maintenance Measures

Consider the following practices to help prevent the discharge of pollutants to stormwater from equipment/vehicle fueling and maintenance. Include the locations of these areas and your inspection and maintenance procedures in your SWPPP.

- Train employees and subcontractors in proper fueling procedures (stay with vehicles during fueling, proper use of pumps, emergency shut-off valves, and such)
- Inspect on-site vehicles and equipment daily for leaks, equipment damage, and other service problems
- Clearly designate vehicle/equipment service areas away from drainage facilities and watercourses to prevent stormwater run-on and runoff
- Use drip pans, drip cloths, or absorbent pads when replacing spent fluids
- Collect all spent fluids, store in appropriate labeled containers in the proper storage areas, and recycle fluids whenever possible

P2 Principle 5: Control equipment/vehicle washing and allowable non-stormwater discharges.

Environmentally friendly washing practices can be practiced at every construction site to prevent contamination of surface and ground water from wash water. Procedures and practices include using off-site facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water or routing to the sanitary sewer; and training employees and subcontractors in proper cleaning procedures.

Take a Closer Look...

Non-Stormwater Runoff

A construction site might have sources of runoff that are not generated by stormwater. These non-stormwater discharges include fire hydrant flushing, vehicle or equipment wash water (no detergents!), water used to control dust, and landscape irrigation.

What does this mean to me?

Take steps to infiltrate these sources of uncontaminated water into the ground. You can also route these sources of water to sediment ponds or detention basins or otherwise treat them with appropriate BMPs.

SWPPP Tip!

Equipment/Vehicle Washing Measures

The following equipment/vehicle washing measures will help prevent stormwater pollution. Include the location of your washing facilities and your inspection and maintenance procedures in your SWPPP.

- Educate employees and subcontractors on proper washing procedures
- Clearly mark the washing areas and inform workers that all washing must occur in this area
- Contain wash water and treat and infiltrate it whenever possible
- Use high-pressure water spray at vehicle washing facilities without any detergents because water can remove most dirt adequately
- Do not conduct any other activities, such as vehicle repairs, in the wash area

requirements and ensure that clear and concise spill cleanup procedures are provided and posted for areas in which spills may potentially occur. When developing a spill prevention plan, include, at a minimum, the following:

- Note the locations of chemical storage areas, storm drains, tributary drainage areas, surface waterbodies on or near the site, and measures to stop spills from leaving the site
- Specify how to notify appropriate authorities, such as police and fire departments, hospitals, or municipal sewage treatment facilities to request assistance
- Describe the procedures for immediate cleanup of spills and proper disposal
- Identify personnel responsible for implementing the plan in the event of a spill

P2 Principle 6: Develop a spill prevention and response plan.

Most state and EPA construction general permits require the preparation of spill prevention and response plans. Generally, these plans can be included or incorporated into your SWPPP. The plan should clearly identify ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and response. The plan should also specify material handling procedures and storage

SWPPP Tip!

Spill Prevention Measures

Additional spill prevention measures that will help prevent spills and leaks include the following:

- Describe and list all types of equipment to be used to adequately clean up the spill
- Provide proper handling and safety procedures for each type of waste
- Establish an education program for employees and subcontractors on the potential hazards to humans and the environment from spills and leaks
- Update the spill prevention plan and clean up materials as changes occur to the types of chemicals stored and used at the facility

Take a Closer Look...

Spill Prevention, Control and Countermeasure (SPCC) Plan

Construction sites may be subject to 40 CFR Part 112 regulations that require the preparation and implementation of a SPCC Plan to prevent oil spills from aboveground and underground storage tanks. Your facility is subject to this rule if you are a nontransportation-related facility that:

- Has a total storage capacity greater than 1,320 gallons or a completely buried storage capacity greater than 42,000 gallons and
- Could reasonably be expected to discharge oil in quantities that may be harmful to navigable waters of the United States and adjoining shorelines

Furthermore, if your facility is subject to 40 CFR Part 112, your SWPPP should reference the SPCC Plan. To find out more about SPCC Plans, see EPA's website on SPCC at www.epa.gov/oilspill/spcc.htm

What does this mean to me?

Reporting Oil Spills

In the event of an oil spill, you should contact the National Response Center toll free at 1-800-424-8802 for assistance, or for more details, visit their website: www.nrc.uscg.mil/nrchp.html

Appendix K

Reference Documents

Construction SWPPP Reference Documents

Document	Title	Website/Update Information
General Construction Permit	National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08-DWQ, NPDES No. CAS000002) issued by the State Water Resources Control Board	http://www.swrcb.ca.gov/stormwtr/construction.html Once at the site click on the highlighted link titled "Construction General Permit, 99-08-DWQ". An update to the 99-08 Order is under consideration
General Linear Utility Permit	NPDES General Permit for Storm Water Discharges Associated with Construction Activity from Small Linear Underground/Overhead Projects, Water Quality Order No. 2003-0007 issued by the State Water Resources Control Board	http://www.swrcb.ca.gov/stormwtr/construction.html Once at the site click on the highlighted link titled "Small LUP General Permit".
EPA Guide for Construction Sites	Environmental Protection Agency (EPA) Developing Your Stormwater Pollution Prevention Plan – A Guide for Construction Sites EPA 833-R-060-04 May 2007	http://www.epa.gov/npdes/swpppguide
CASQA Construction Handbook	California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook Construction January 2003	http://www.cabmphandbooks.com Click on Construction. Also check for Errata Sheets
Caltrans Construction Site BMP Manual	California Department of Transportation (Caltrans) Stormwater Quality Handbook - Construction Site Best Management Practices March 1, 2003	http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm
Caltrans SWPPP/WPCP Preparation Manual	California Department of Transportation (Caltrans) Stormwater Quality Handbook - Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual – Construction Site Best Management Practices (BMPs) Reference Manual March 2007	http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm

For a more complete listing of additional references and suggested resources on storm water pollution prevention planning, see the Suggested Resources List attached as Appendix D to Section 2 (Standard Urban Storm Water Mitigation Plan) included in the City of Carlsbad Storm Water Standards Manual.